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FISH AND WILDLIFE SERVICE

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MEMORANDUM

To: Project Leader, Benton Lake NWR
From: ^{Acting} Refuge Supervisor, Zone I
Subject: 1986 Narrative

Good job on this year's Narrative, Bob and crew. Those reading it will have a good understanding of Benton Lake and its management program.

Your introduction was pretty inclusive, but I would suggest a paragraph on the pumping operation at Power and its cost would give people some additional insight to Refuge operations.

Made insert for Circulating NR.
and station Copies.

R. Raper



REVIEW AND APPROVALS

BENTON LAKE NATIONAL WILDLIFE REFUGE

Great Falls, Montana

ANNUAL NARRATIVE REPORT

Calendar Year 1986

Robert L. Pearson 2/27/87
Refuge Manager Date

Refuge Supervisor Review Date

Regional Office Approval Date

INTRODUCTION

Location/Habitat Zone

Western edge of northern Great Plains some 50 miles east of the Rocky Mountains. Twelve miles north of Great Falls, Montana, on the Bootlegger Trail (State 225).

Natural Features

Six thousand acre glacial lake bed with a 350 square mile watershed drained by Lake Creek. The bottom elevation in the lake basin is at 3613 msl with a recent record high water level of 3620.03 in the spring of 1979. Water levels in excess of 3633 msl would flow out of Benton Lake through Black Horse Lake, then on to the southeast some 15 miles to the Missouri River. Grasslands are native short prairie, primarily composed of western wheatgrass and green needlegrass.

Established 1929

President Herbert Hoover set aside 12,235 acres for "use as a refuge and breeding grounds for birds" by Executive Order.

The unit was unmanned until 1961. Natural runoff provided only occasional good years - its potential was proven but good water years were too infrequent. Habitat conditions adequate to support waterfowl production, migrational use and hunting use were undependable.

Development

Local support and political pressure finally resulted in the Fish and Wildlife Service obtaining a major supplemental water source in 1957 - - return irrigation flows in Muddy Creek from the Greenfields Irrigation District - - and the subsequent development of a pumping station and associated delivery systems into Lake Creek to provide water annually to Benton Lake.

The old glacial lake bed was subdivided into six marsh units with dikes and control structures to allow somewhat independent diversion into these units.

The headquarters complex was completed in 1962 and personnel assigned for active management.

Management Practices

In the 1960's management was concerned with stabilizing and protecting the new dikes and water control structures. Grazing intensity was reduced to improve range conditions. Shelterbelt shrub and tree plantings were undertaken. Six hundred acres were broken out of the native grasslands and planted to small grains for supplemental food supplies for the increasing waterfowl numbers.

In the 1970's the 600 acres of cropland were gradually converted to a permanent nesting cover (DNC) for the ducks. Cattle grazing was terminated to improve nesting cover conditions on the native grasslands. Research studies have proven that substantial wildlife benefits are gained by eliminating grazing from duck production areas. Studies at Benton Lake indicate an annual use of as many as nine duck nests per acre on the DNC units and about a tenth that rate on native grasslands. Botulism, a poisonous toxin producing bacteria, became a serious problem with up to 20,000 birds lost in one year. Water level manipulations and cleanup operations have kept losses to 2000 or less in recent years.

In the 1980's new management thrusts are focusing on increasing emergent cover distribution through the use of a new inter-unit pumping system. The four lower units will be operated at a shallower water depth and the accumulating excessive salt load (TDS) will gradually be flushed into Unit IV to try to freshen the water in the other units.

Increasing nesting islands and artificial nesting structures such as round straw bales are being used in combination with a temporary hunting season closure to stimulate local production of Canada geese. Botulism hazards are being further reduced by developing complete drainage capability on each unit by ditching. Water surface acres are being reduced somewhat to help offset the deficit in nesting cover and to help reduce energy costs.

The permanent nation-wide decline in available wildlife habitat necessitates intensive manipulations of both habitat and animal populations in a variety of ways to meet specific goals.

Wildlife Response

Of some 378 bird species known to visit Montana, 197 have been recorded at Benton Lake and new ones are observed each year and added to the bird list. Of the 60 species known to nest at Benton Lake, 12 are ducks. Annual duck production has exceeded 39,000 but averages closer to 20,000. Canada goose production has reached 270 and is increasing. Other migratory birds that reproduce here by the thousands include the Franklin gull, eared grebe and the American coot. The upland game birds of gray partridge and ring-necked pheasant have responded well to the improvements in upland food and cover as have the mourning dove and many other small birds. Use by the burrowing owl, long-billed curlew and McCowan's longspur has declined.

The second goal at Benton Lake is to provide for the needs of birds during the spring and fall migrations as the birds move to summer production areas north of here and to wintering areas to the south and southwest. Peak ducks - 100,000 (April and September); tundra swan - 6000 (April and November); Canada geese - 2000 (November). Use by the endangered bald eagle and peregrine falcon has also increased in recent years.

Due to the extreme winter climate and lack of topographic diversity at Benton Lake, resident species diversity and numbers is somewhat limited. The marsh is too shallow to sustain a fish population.

We have records of twenty different species of mammals occurring here but only a very few reptiles and amphibians. In the winter the white-tailed jackrabbit and the long-tailed weasel are the mammals most frequently seen. In the summer the Richardson's ground squirrel (gopher) and the muskrat are the most frequently seen. Both species of deer and the pronghorn are seen in low numbers on the refuge.

Benton Lake is now one of the most productive waterfowl refuges in the United States.

Public Use

Public use is limited to day use from March through November of each year. The local school system uses the refuge for well organized environmental education field trips in May studying plants, birds and insect life. A hunting program is conducted on part of the refuge in October and November for waterfowl and limited harvest of upland game birds is allowed. Special regulations and information on the hunt are printed with a map and are available from the refuge.

Most of our visitors enjoy observing or photographing wildlife. There are no facilities on the refuge for picnicking or camping.

The refuge staff also administers the Small Wetlands Program in ten north central counties in Montana. In this program permanent marsh habitat has been acquired with duck stamp dollars. The purchased marsh units are identified with boundary signs as Waterfowl Production Areas. An important part of this program involves the converting of cropland acres into secure permanent nesting cover (DNC). We currently manage 19 units in this program with just over 11,364 acres. All of these units but one are open to trapping and hunting in accordance with state regulations.

Permanent protective easements are also purchased on temporary and seasonal wetlands to protect them from draining, filling and burning of the marsh vegetation.

Executive Order

BENTON LAKE BIRD REFUGE, MONTANA

It is hereby ordered that the unappropriated public lands hereinafter described in terms of the public-land surveys, and shown on the diagram hereto attached and made a part of this order, situated at Benton Lake in the State of Montana, in Ts. 22 and 23 N., R. 3 E., and in T. 22 N., R. 4 E., P. M., be and the same are hereby reserved and set apart for the use of the Department of Agriculture as a refuge and breeding ground for birds, subject to existing valid rights:

Principal Meridian

In T. 22 N., R. 3 E., W $\frac{1}{2}$ and S $\frac{1}{2}$ SE $\frac{1}{4}$ Sec. 2, all Secs. 3, 4 and 5, E $\frac{1}{2}$ E $\frac{1}{2}$, SW $\frac{1}{4}$ SE $\frac{1}{4}$, Lots 5, 6, and E $\frac{1}{2}$ SW $\frac{1}{4}$ Sec. 6, NE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 7, N $\frac{1}{2}$ N $\frac{1}{2}$, SE $\frac{1}{4}$ NE $\frac{1}{4}$, NE $\frac{1}{4}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$ and SE $\frac{1}{4}$ Sec. 8, all Secs. 9, 10 and 11, NW $\frac{1}{4}$ NW $\frac{1}{4}$ Sec. 12, NW $\frac{1}{4}$ NW $\frac{1}{4}$, S $\frac{1}{2}$ N $\frac{1}{2}$ and S $\frac{1}{2}$ Sec. 13, all Secs. 14 and 15, N $\frac{1}{2}$, E $\frac{1}{2}$ SW $\frac{1}{4}$ and SE $\frac{1}{4}$ Sec. 16, N $\frac{1}{2}$ Sec. 17, NE $\frac{1}{4}$, NE $\frac{1}{4}$ NW $\frac{1}{4}$ and S $\frac{1}{2}$ NW $\frac{1}{4}$ Sec. 18, NE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 21, N $\frac{1}{2}$ N $\frac{1}{2}$ and SE $\frac{1}{4}$ NE $\frac{1}{4}$ Sec. 22, all Secs. 23, 24 and 25, NE $\frac{1}{4}$, N $\frac{1}{2}$ NW $\frac{1}{4}$ and NE $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 26;

In T. 23 N., R. 3 E., SE $\frac{1}{4}$ Sec. 34, NW $\frac{1}{4}$ SW $\frac{1}{4}$ and S $\frac{1}{2}$ SW $\frac{1}{4}$ Sec. 35;

In T. 22 N., R. 4 E., SW $\frac{1}{4}$ NW $\frac{1}{4}$, NW $\frac{1}{4}$ SW $\frac{1}{4}$, S $\frac{1}{2}$ SW $\frac{1}{4}$ and SW $\frac{1}{4}$ SE $\frac{1}{4}$ Sec. 18, W $\frac{1}{2}$ E $\frac{1}{2}$ and W $\frac{1}{2}$ Sec. 19, W $\frac{1}{2}$ E $\frac{1}{2}$ and W $\frac{1}{2}$ Sec. 30, and N $\frac{1}{2}$ Sec. 31.

It is unlawful, within this reservation, (a) to hunt, trap, capture, wilfully disturb, or kill any wild animal or bird of any kind whatever, or take or destroy the eggs of any wild bird, to occupy or use any part of the reservation, or enter thereon for any purpose, except under such rules and regulations as may be prescribed by the Secretary of Agriculture; (b) to cut, burn or destroy any timber, underbrush, grass, or other natural growth; (c) wilfully to leave or suffer fire to burn unattended near any timber or other inflammable material; (d) after building a fire in or near any forest, timber, or other inflammable material, to leave it without totally extinguishing it; and (e) wilfully to injure, molest, or destroy any property of the United States.

Warning is expressly given to all persons not to commit any of the acts herein enumerated, under the penalties prescribed by Sections 106, 107 and 145 of Title 18, Chap. 4, United States Code, or by the act of February 18, 1929 (U. S. C. Supp. 3, Title 16, Chap. 7a, Sec. 715i).

This refuge shall be known as the Benton Lake Bird Refuge.

HERBERT HOOVER

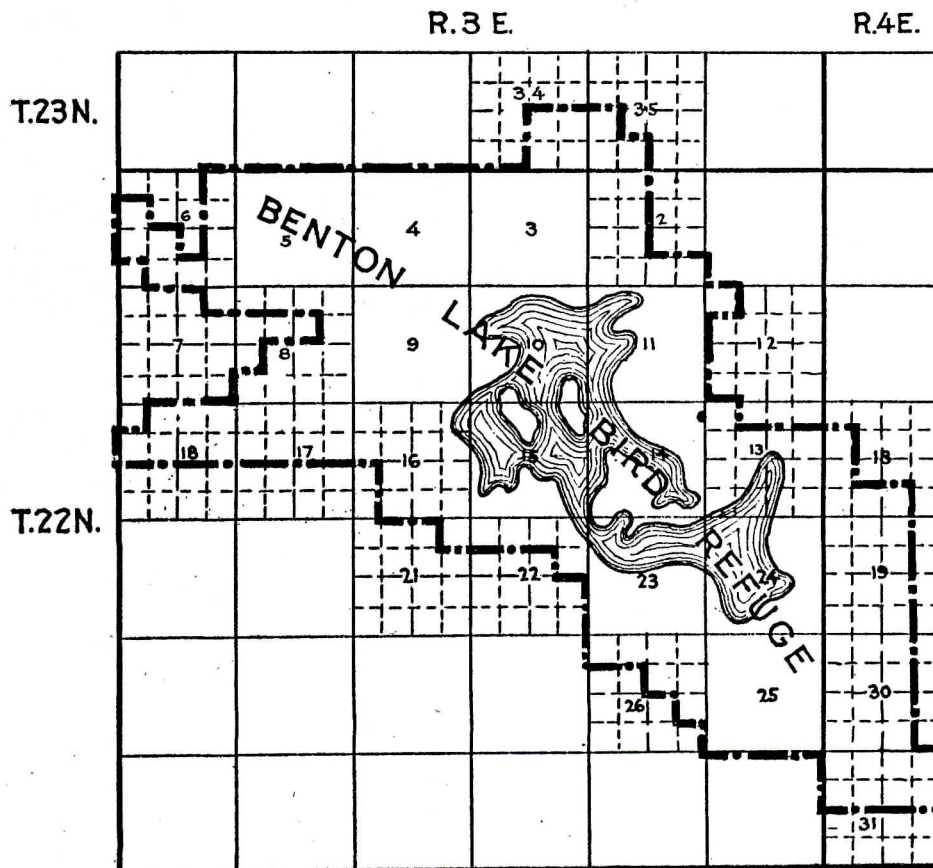
THE WHITE HOUSE,

November 21, 1929.

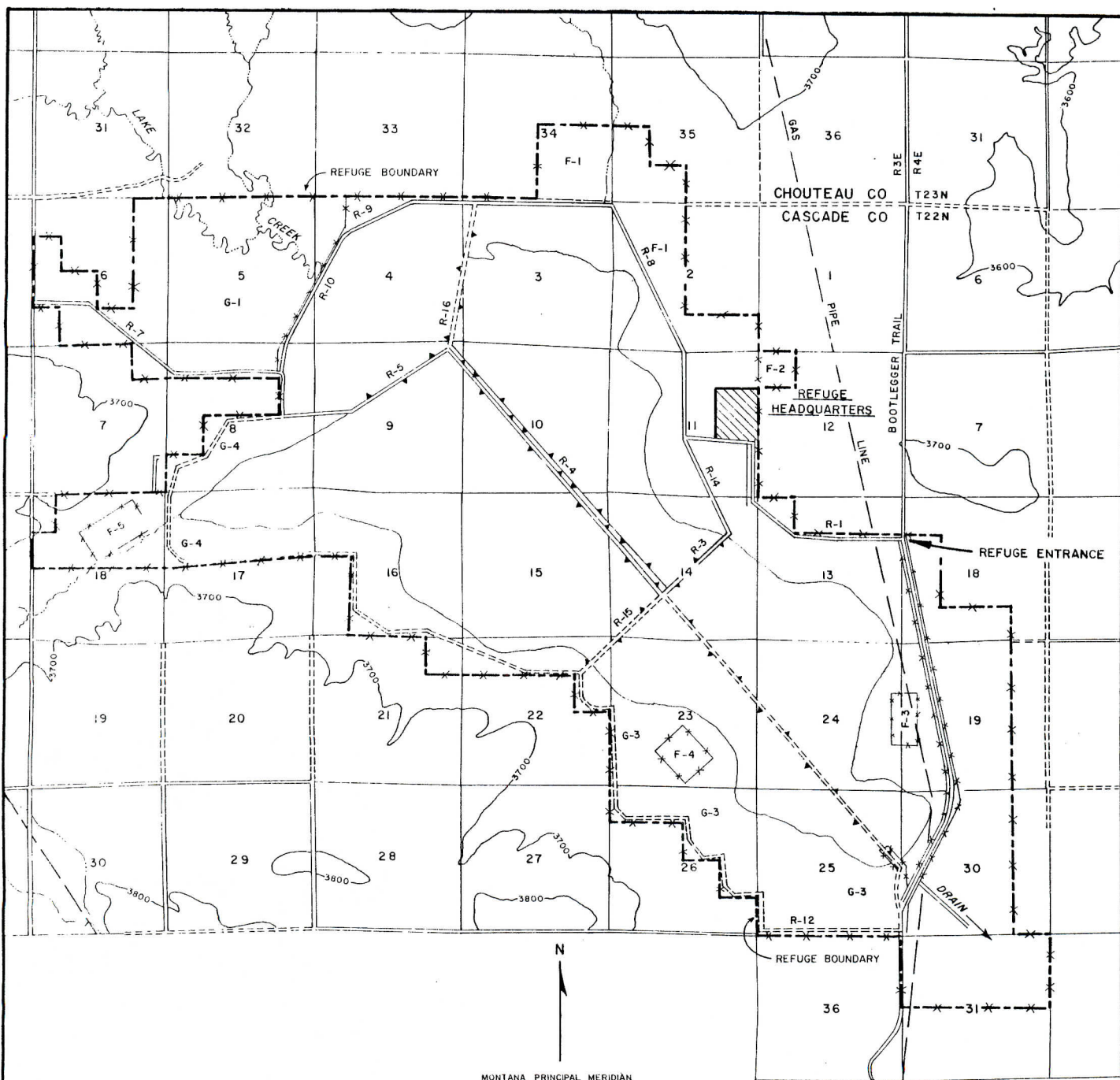
[No. 5228]

BENTON LAKE BIRD REFUGE MONTANA

Embracing parts of Townships 22 and 23 North, Ranges 3 and 4 East, Principal Meridian, Montana, as segregated by broken line and designated as "Benton Lake Bird Refuge".



DEPARTMENT OF THE INTERIOR
RAY LYMAN WILBUR, SECRETARY
GENERAL LAND OFFICE
C.C. MOORE, COMMISSIONER.



MONTANA PRINCIPAL MERIDIAN



UNITED STATES DEPARTMENT OF THE INTERIOR
FISH AND WILDLIFE SERVICE
BUREAU OF SPORT FISHERIES AND WILDLIFE
BENTON LAKE NATIONAL WILDLIFE REFUGE
CASCADE AND CHOUTEAU COUNTIES, MONTANA

INTRODUCTION

TABLE OF CONTENTS

Page

A. HIGHLIGHTS 1

B. CLIMATIC CONDITIONS 2

C. LAND ACQUISITION

1. Fee Title Nothing to Report
2. Easements Nothing to Report
3. Other Nothing to Report

D. PLANNING

1. Master Plan Nothing to Report
2. Management Plan 3
3. Public Participation Nothing to Report
4. Compliance with Environmental and Cultural Resource Mandates . 3
5. Research and Investigations 3
6. Other Nothing to Report

E. ADMINISTRATION

1. Personnel 8
2. Youth Programs 11
3. Other Manpower Programs Nothing to Report
4. Volunteer Programs 13
5. Funding 13
6. Safety 14
7. Technical Assistance 15
8. Other Nothing to Report

F. HABITAT MANAGEMENT

1. General Nothing to Report
2. Wetlands 16
3. Forests Nothing to Report
4. Croplands Nothing to Report
5. Grasslands 34
6. Other Habitats Nothing to Report
7. Grazing Nothing to Report
8. Haying Nothing to Report
9. Fire Management 35
10. Pest Control 35
11. Water Rights 36
12. Wilderness and Special Areas Nothing to Report
13. WPA Easement Monitoring Nothing to Report

G. WILDLIFE

Page

1. Wildlife Diversity	37
2. Endangered and Threatened Species	37
3. Waterfowl	37
4. Marsh and Water Birds	46
5. Shorebirds, Gulls, Terns and Allied Species	46
6. Raptors	47
7. Other Migratory Birds	Nothing to Report
8. Game Animals	47
9. Marine Mammals	Nothing to Report
10. Other Resident Wildlife	47
11. Fishery Resources	Nothing to Report
12. Wildlife Propagation and Stocking	Nothing to Report
13. Surplus Animal Disposal	Nothing to Report
14. Scientific Collections	Nothing to Report
15. Animal Control	48
16. Marking and Banding	48
17. Disease Prevention and Control	49

H. PUBLIC USE

1. General	51
2. Outdoor Classrooms - Students	51
3. Outdoor Classrooms - Teachers	Nothing to Report
4. Interpretive Foot Trails	Nothing to Report
5. Interpretive Tour Routes	Nothing to Report
6. Interpretive Exhibits/Demonstrations	Nothing to Report
7. Other Interpretive Programs	51
8. Hunting	52
9. Fishing	Nothing to Report
10. Trapping	Nothing to Report
11. Wildlife Observation	53
12. Other Wildlife Oriented Recreation	Nothing to Report
13. Camping	Nothing to Report
14. Picnicking	Nothing to Report
15. Off-Road Vehicling	Nothing to Report
16. Other Non-Wildlife Oriented Recreation	Nothing to Report
17. Law Enforcement	53
18. Cooperating Associations	Nothing to Report
19. Concessions	Nothing to Report

I. EQUIPMENT AND FACILITIES

1. New Construction	55
2. Rehabilitation	61
3. Major Maintenance	62
4. Equipment Utilization and Replacement	62
5. Communications System	Nothing to Report
6. Computer Systems	Nothing to Report
7. Energy Conservation	Nothing to Report
8. Other	63

J. OTHER ITEMS

Page

1. Cooperative Programs	Nothing to Report
2. Other Economic Uses	Nothing to Report
3. Items of Interest	Nothing to Report
4. Credits	63

K. FEEDBACK	64
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A. HIGHLIGHTS

Severe spring weather on April 14th killed many trees and shrubs (F.2).

The 1985-86 Ducks Unlimited project (Unit IVb) became operational producing many ducks and geese (I.1).

Habitat development in Unit V made good progress (F.2).

A more permanent nesting structure was used by both mallards and Canada geese (F.2).

Spring waterfowl peak population of 116,000 (G.3).

Waterfowl production reached near peak levels with 39,000 ducks and 270 Canada geese (G.3).

Second (final) year of Mallard Brood Survival Study completed (D.5).

A new domestic water supply was piped 2 3/4 miles into refuge headquarters (I.1).

David Linehan filled the Assistant Manager's position in September (E.1).

Inter-agency Contaminant Study on selenium and related chemicals (D.5).

Vince Marko promoted to Engineering Equipment Operator, WG-10 (E.1).

Scott Foster went on disability in May following a knee injury last summer and surgery in December (E.1).

Steel shot requirement instituted at Benton Lake (H.8).

B. CLIMATIC CONDITIONS

Nineteen eighty-six was a year of moderate temperatures and below normal precipitation.

January tied for the second warmest on record and had below normal precipitation. February brought a record low of -22° on the 16th and a record high of 68° on the 28th accompanied by rapid spring runoff. March was the second warmest on record with no snow and very little rain.

April showers did great things for the Great Falls area. We received 14.1 inches of snow and 1.6 inches of rain. May and June brought good precipitation although less than previous years.

July was cooler and wetter than normal. We didn't even hit the 100° mark this summer. August was extremely dry until the 31st when nearly an inch of rain was received. September was a very cool damp month with a light snowfall on the 12th.

The first ten days of October were cool and wet with dry conditions the rest of the month. Arctic air moved in the second week of November and eight inches of snow fell. Chinook winds arrived the following week and continued through the end of December. Only light amounts of snow were received and we ended 1986 with sunny skies, strong winds and bare ground.

The weather information on the following table was provided by the National Weather Service at Great Falls International Airport, some 18 miles southwest of the refuge. There are considerable differences in both temperatures and precipitation between the two locations. The refuge usually receives more snow than Great Falls but the annual precipitation is somewhat less, or in the case of 1986, considerably less.

TABLE I

WEATHER TABLE - 1986

	G R E A T F A L L S				REFUGE
	Temperature (F)		Precipitation		Precipitation
	High	Low	Total	Depart	Total
January	61	6	.57	-.43	.28
February	68	- 22	.75	.00	.75
March	73	21	.10	-.83	.09
April	75	3	2.83	1.34	2.04
May	89	29	1.74	-.78	1.55
June	94	42	1.72	-1.03	.66
July	98	43	1.67	.57	1.27
August	97	45	.81	-.50	.75
September	78	37	1.52	.49	2.81
October	71	6	.90	.08	.47
November	63	- 14	.45	-.29	.52
December	53	0	.27	-.53	.40
1986	98	- 22	13.33	-1.91	11.59



An extreme temperature change from 70° on April 8th to 3° on April 14th had drastic effects on broad leafed trees and shrubs. Surviving trees had a significant delay in leaf production chronology.

86-10-4

06/86

RLP

D. PLANNING

2. Management Plans

Annual plans submitted to the Regional Office included the Burn Plan, Water Management Plan, Hunting Plan Review/Section 7, Pesticide Use Proposal and Annual Work Plan. Assistance was provided for the development of the Kleinschmidt Lake Mitigation Plan.

Despite the complexity of agricultural contaminant problems, the refuge manager was saddled with a short deadline and the task of writing the Remedial Action Plan for addressing contaminant issues on the refuge. The plan was then assembled with other Region 6 plans and issued to the public as a response to the "Preliminary Survey of Contaminant Issues of Concern on National Wildlife Refuges". Appendices and letters in this report were so poorly reproduced that they are unreadable. It is our understanding that this "document" was to go to each member of Congress. Where was our quality control?

4. Compliance with Environmental and Cultural Resource Mandates

The refuge Hunting Plan was reviewed for NEPA compliance and the annual Section 7 review was conducted.

5. Research and Investigations

a. Benton Lake NR 85 - "Daily Survival Rates, Movements and
Habitat Use by Mallard Broods on Benton Lake
National Wildlife Refuge"
61510-01

University of Montana Cooperative Education student Dennis Orthmeyer completed a second year of research on survival rates, movements and habitat use of mallard broods on the refuge. Questionable brood survival, the least understood component of the recruitment equation, combined with increasing salinity levels on this refuge led to the initiation of the study.



Student Assistant Brad Rogers releases a mallard hen after a radio pack with whip antenna and nasal (visual) marker have been installed. Note conibear box trap set in background.
Personal Photo 06/86

DLO

Mallard hens were trapped on the nest and fitted with nylon nasal markers and a 13 gram radio transmitter. Locations of radioed nesting hens were taken one to two times daily. Within six hours of the hen leaving the nest with the brood, the nest was visited to determine the number of hatched eggs. After hatch one to four radio triangulations were done daily. Visual counts of each brood were made every five to eight days.

In the first year of the study 16 incubating hens were captured on their nests. Ten of the 16 hens were successful in hatching. After hatching one hen's radio failed or she left the refuge, three hens experienced total brood loss and six hens fledged broods.

From April 15 to August 15, 1986, twenty-five mallard hens were trapped and affixed with radios. Two nests were destroyed by predators before hatch, 3 nests were abandoned due to investigator presence and twenty nests were hatched successfully. Of the twenty broods, 1 radio failed, 3 failed during the brood raising period, 5 hens experienced total brood loss and eleven fledged broods.

Results for both years are summarized in Table II. Out of the combined 41 mallard hens trapped during the study, 31 (76%) successfully hatched nests, 17 (54%) of these fledged broods, 10 (32%) of the hens experienced total brood loss, and 5 (16%) brood fates were recorded as unknown. Dennis will be analyzing data and writing the results this winter toward completion of his Masters Degree Program.

TABLE II
RESULTS OF MALLARD HENS
MARKED IN 1985 AND 1986

1985				1986			
Hen No.	No. Young Hatched	No. Young Fledged	Home Range Acres	Hen No.	No. Young Hatched	No. Young Fledged	Home Range Acres
809	9	5	208	256	10	7	1660
272	8	5	413	383	6	5	275
761	10	2	993	443	2	2	132
988	9	5	2400	503	12	8	249
553	9	4	652	511	7	Unk	794
943	7	6	192	543	9	5	2995
715	8	0	1250	560	10	6	414
870	7	0	24	575	9	0	463
589	10	0	649	633	6	Unk	785
342	4	0	-	842	8	3	436
				867	6	6	1140
				885	3	3	1756
				966	10	0	464
				784	8	3	446
				739	10	3	163
				733	9	0	387
				803	7	0	1067
				428	7	Unk	Unk
				479	7	0	1076
				561	7	0	260

b. Interagency Screening Study - Sun River Project

Selenium was first suspected as a contaminant at Benton Lake when an article in the Sacramento Bee by Tom Harris probed the possibility of a wide spread selenium problem which had already been linked to wildlife deformities at Kesterson NWR. Harris reported a selenium concentration of 8500 ppb in a sediment sample he analyzed from Benton Lake. Even higher levels were found later in sediment samples taken in November, 1985, by Refuge Manager Pearson and RCA Biologist Bill Jones.

In response to the Sacramento Bee news article, Congressional action called the Department of Interior into action. An Interior Task Group on Irrigation Drainage was formed. An Inter-agency (FWS, BOR, USGS, MT Fish, Wildlife and Parks, Greenfields Irrigation District) team met at Benton Lake Refuge headquarters on February 5, 1986, and drew up a draft of a "field screening study" to determine if irrigation drainage waters have caused or have the potential to cause harmful affects on human health, fish and wildlife or other water uses. The field study at Benton Lake Refuge is part of the Sun River project study area which includes the Fairfield Bench, the Sun River, Freezeout Lake and Priest Lake. Much of the off-refuge sample site data will be important to evaluating the on-refuge contaminant problems.

The refuge problem is compounded by the various sources of contaminants. First to be suspected is irrigation return flows from the Greenfields Irrigation Project which are used to maintain refuge marsh units. Also, Benton Lake is the lowest point in the 240 square miles Lake Creek Watershed and receives salts and transported contaminants from drainage of saline seeps as well as other agricultural runoff.



John Lambing, USGS, collecting sediment samples from Unit VI as part of the interagency screening study on irrigation runoff contaminants -- selenium in particular.
86-15-11 08/12/86 RLP

The interagency field team established 13 biological sampling sites including seven sites on the refuge. Water and sediment sampling was done by USGS in the summer of 1986. Refuge staff

assisted Bill Jones in the collection of eggs and flesh for analysis of concentrations of selected metals and trace elements (e.g. arsenic, cadmium, chromium, mercury, boron, lead and selenium). One fresh egg from each of 32 coot nests and 14 avocet nests were collected in May and June. Young of the year coot (8) and avocet (2) were collected for tissue analysis. In addition, invertebrate, algae and plant samples were collected at each site.



Bill Jones, RCA (Billings, MT), collecting invertebrates from Unit IV borrow ditch. Several thousand "blood worms" were required to compose the sample of midge fly larvae. Interagency screening study on selenium. 86-14-17 07/30/86 RLP

Early results of this study appear to further confirm elevated selenium levels at Benton Lake. Future studies will be needed to sort out the magnitude of the problem, sources of contaminants and management options.

E. ADMINISTRATION

1. Personnel



PERMANENT PERSONNEL

1. Robert L. Pearson, Refuge Manager - GS-11 - EOD 08/27/77
2. Thomas R. Tornow, Assistant Manager - GS-9 - EOD 07/11/82*
3. David D. Linehan, Assistant Manager - GS-9 - EOD 09/23/86**
4. Elizabeth A. Benway - Refuge Assistant - GS-5 - EOD 07/28/68
5. Vincent J. Marko - Engineering Equipment Operator - WG-10 - EOD 04/30/62
6. J. Scott Foster, Maintenance Worker - WG-7 - EOD 06/26/83***

TEMPORARY PERSONNEL

1. Bradley Peterson, Bio Aide - GS-4 - 04/14 - 11/22/86
2. Dennis L. Orthmyer, Coop Ed Student - GS-5 - 04/21 - 10/11/86
3. Ronald D. Wynegar, Laborer - WG-2 - 06/23/86 - present
4. Brian Friend, YCC Enrollee - 06/09 - 09/18/86
5. Shawn Szirbik, YCC enrollee - 06/09 - 08/22/86

* Transferred to Madison Wetland Management District 07/20/86

** Transferred from Upper Souris NWR

*** Placed on Worker's Compensation 05/06/86



Seasonal employees releasing stress! - - stressed mallards, that is.
From left - Shawn Szirbik, Dennis Orthmeyer, Brad Peterson and Brian
Friend.

86-8-26

08/86

D0



A four year tour of duty at Benton Lake did great things for Tom. He
got married to Barbara and they now have two sweet children, Meranda and
Ted. We will all miss their friendly enthusiasm that brightened our
lives. Good luck!

86-12-7

07/86

RLP

Nineteen eight-six brought several personnel changes to Benton Lake Refuge.

Maintenanceman Scott Foster had knee surgery in December, 1985, following an on-the-job injury earlier that year. He returned to light duty on January 29th and continued in that status until May 6th. At that time his doctor stated that she could not tell us when or if he would be able to return to his regular duties. We requested that Scott apply for worker's compensation and at year's end his condition remains the same.

Dennis Orthmeyer, graduate student at the University of Montana, returned for his second season on April 21st. Under the Fish and Wildlife Service Cooperative Education program Dennis is working toward his Masters Degree studying the daily survival rates, movements and habitat use of mallard broods at Benton Lake.

As a refuge manager trainee, GS-5, Dennis assisted in many refuge activities including nest studies, banding, monthly activity and output reporting, botulism checks and general refuge maintenance, in addition to the many hours spent on his project. Dennis returned to school in October and we eagerly await his final thesis.

Bradley Peterson reported for duty on April 14 as a Bio Aid, GS-4. Brad assisted with the nest study - completing the final report, banding program, island seeding, botulism surveillance, supervised the YCC crew, hauled water and provided support in the maintenance program. Brad's appointment was terminated on November 22.

To help fill in during Scott Foster's absence, Ron Wynegar was hired as a Laborer, WG-2, on June 23rd. His appointment is for not to exceed one year and he will continue at the refuge until a decision is made concerning a replacement for Scott Foster.

In July Tom Tornow transferred to the assistant manager position at Madison Wetland Management District in South Dakota. Tom, Barb and their family were given a sendoff picnic and we all wish them well in their new location.

Dave Linehan transferred in from Upper Souris NWR in North Dakota as the new assistant manager in September. Dave, Sue and their four children are residing at the refuge and are welcome members of the refuge group. One of Dave's first efforts at community involvement was to serve as compiler for the Christmas Bird Count for the Upper Missouri Breaks Audubon Club.

In August Vince Marko was promoted from Maintenanceman, WG-8, to Engineering Equipment Operator, WG-10, a promotion long overdue. Congratulations, Vince!

At year's end we are awaiting the arrival of Gary Sullivan who is transferring in from Quivira NWR to fill the position of second assistant manager.

Training during the year included:

Pearson, Tornow and Foster attended law enforcement training in Bismarck, ND in April and Pearson attended a law enforcement workshop and pistol qualification at C.M. Russell NWR in September.

Benway attended a one day course "Skills and Techniques for Secretarial Effectiveness" in Helena in November.

In May all personnel took eight hours of First Aid training and eight hours of CPR training.

Meetings attended were as follows:

Pearson: Pacific Flyway Wing Bee - Redding, CA
Interagency Wetlands Tour - Billings, MT
Public meeting on non-toxic shot sponsored by Mt. Dept. of Fish, Wildlife and Parks - Great Falls
Project leaders meeting at Allentown with tour of the National Bison Range
Met with County Commissioners in Toole, Cascade, Teton, Hill, Chouteau and Glacier Counties and delivered Revenue Sharing checks

Tornow: Conservation Reserve Program review - Lewistown
Project leaders meeting - Billings
Kleinschmidt Lake mitigation planning meetings

Linehan: Saline Control Forum - Conrad
Range Workshop - Great Falls
Tri-County Water District - Dutton
Conrad/Shelby WAPA Transmission Line meeting - Shelby

TABLE III

PERSONNEL

FY	Full Time	Temporary	YCC	FTE
1986	5	3	2	6 *
1985	5	2	2	5.9
1984	5	2	2	5
1983	5	2	2	5
1982	4	2	1	4

*Scott Foster - FT employee - on duty 5 months
Does not include YCC

2. Youth Programs

Two YCC enrollees were recruited through the local Job Service office in Great Falls. Brian Friend, a recent graduate of C.M. Russell High School and Shawn Szirbik, a junior at Great Falls High School, reported for duty on June 9th.



YCC enrollees Brian Friend (left) and Shawn Szirbik (right) were very capable and willing workers. One of their many helpful projects was that of reducing the stark contrast between concrete nesting structures and the marsh habitat - to improve esthetic acceptability. Note exit hole and nest straw inside this 4' x 8' RCP.
86-16-14 08/20/86 BP



YCC enrollees enjoyed their (art) work experience and gained much insight on refuge operations and wildlife. Two of these structures are located in Unit VI and have been successfully used by both Canada geese and mallard ducks for nesting each year since placed. They require little maintenance and are thought to be very predator resistant.
86-16-11 08/20/86 BP

Both young men were enthusiastic employees and accomplished many tasks this summer. They assisted in the nest survey and waterfowl banding. Other duties included buildings and grounds maintenance, litter pickup, vehicle cleanup, fence removal, painting of concrete nesting structures, island and dike plantings, and numerous small projects.

Shawn's last day was August 22nd when he left to return to high school. Brian stayed on until September 18th when he left to attend the University of Montana at Missoula.

4. Volunteer Programs

Vince Galli, a member of the Upper Missouri Breaks Audubon Club, assisted with the nest drag and island nest search this summer.

Brad Rogers, a wildlife student at the University of Montana, spent five weeks at Benton Lake assisting Dennis Orthmeyer with his mallard study. Brad spent many hours monitoring radioed hens and collecting invertebrates as part of Dennis' study.

5. Funding

Fiscal year 1986 program costs were kept within the budgeted allotment. Other than salaries, the largest single item in Benton Lake's budget is the cost of pumping water from our pumping station at Power, Montana, to the refuge. Most of our pumping is accomplished in July, August and September so it is necessary for us to program about one-third of our annual budget for the last quarter of the fiscal year.

Thanks to late storms and heavy runoff, our pumping costs were down considerably this year with only 10.7% of our O and M budget of \$198,700 going for pumping. This allowed for the long overdue repair of some equipment and the purchase of some much needed equipment and supplies.

TABLE IV
FUNDING SUMMARY

FY	1260	1210	1220	1240	Rehab	Quarters Maintenance	YCC	TOTAL
86	355,700 ¹					5,500	3,000	368,200
85	325,000 ²					3,000	3,000	331,000
84	275,000 ³				59,000 ⁴	3,100	3,000	337,100
83		185,000	12,000	10,000	60,000 ⁵	1,700	3,000	271,700
82		173,000	8,000	5,000		2,000	1,500	189,500

1 Includes ARMM funds of \$121,000 and Resource Problem funds of \$40,000

2 Includes ARMM funds of \$90,000 and Threats & Conflicts funds of \$40,000

3 Includes ARMM funds of \$70,000

4 Engineering job order carryover from FY 83

5 Engineering job order carryover into FY 84

In addition to the \$198,700 O and M funds, we had \$41,000 for small ARMM projects, \$80,000 for the large ARMM project (new dump truck) and \$40,000 for resource problems. We received \$3,000 for YCC funding and \$5,500 for quarters maintenance. Only \$3,056 was spent on quarters maintenance as \$2,444 was transferred to Red Rock Lakes NWR.

Table IV provides a summary of funding for the past five years.

6. Safety

Four formal safety meetings were held this year and 'safety' is an agenda item on all weekly staff meetings. Safety films viewed this year included "Step Right Up", "Winter Driving" and "Cold Facts". Other safety meeting topics and actions included: ATV training, fire pumper operation, wood burning stove and chimney inspections, smoke alarm checks, emergency natural gas line shut-offs, seat belt use, Lyme disease, emergency radio operation and vehicle driving safety.

Safe, Inc. serviced all station fire extinguishers and they were checked monthly.



Vince Marko doing finish work on the newly constructed guard railing at Unit II outlet structure. Two separate motor vehicle accidents have occurred here recently, one requiring hospitalization of the visitor.
86-9-18 03/14/86 RLP

Special emphasis was again placed on safety and the YCC program. The first day for YCC enrollees was spent mainly on safety orientation, including job hazard analysis, personal protective clothing and equipment safety. A safety orientation was given to all new employees.

An equipment and shop tool checklist was developed and all employees are to be checked out and okayed on each piece of equipment or tool prior to use. Refuge staff received First Aid and CPR training.

The refuge had a good year safety-wise with no major accidents. One YCC'er pinched his finger while loading steel fence posts (no gloves) and Pearson strained his back while collecting invertebrates.

7. Technical Assistance

Considerable time was spent in support of 1985 Farm Bill provisions, especially the Conservation Reserve Program. Tornow sent maps of WPA's and records of grass plantings to SCS District Conservationists in Cascade, Chouteau, Teton, Glacier and Toole Counties. This provided an opportunity for landowners to view 3 to 6 year old grass plantings and also over 10 year old plantings on Benton Lake NWR. Assistance was offered for the CRP sign-up period and also during the development of the conservation plans. The opportunity to harvest grass seed from WPA and refuge plantings was also discussed. A tour of refuge DNC planting was given to the CRP Coordinator for the Montana Department of Fish, Wildlife and Parks.

Assistance, cooperation or information were provided to the following: Western Bird Banding Association, Audubon Christmas Bird Count, Interagency Contaminant Screening Team, Central American University and Forrest Lee. Pearson provided information and assistance to a researcher studying migrational patterns of eared grebes and Wilson's phalaropes associated with Mono Lake, California. Pearson also met with the Teton County Weed Commissioners and Extension Agent regarding knapweed control.

F. HABITAT MANAGEMENT

2. Wetlands

The marsh and water management objectives for Benton Lake as developed in the comprehensive Water Management Plan prepared in 1983 are as follows:

1. Protect the natural and cultural resources.
2. Support and produce identified refuge output objectives; primarily for waterfowl, marsh and shorebirds by providing a stable cross sectional variety of habitat conditions.
3. Maintain and expand emergent cover distribution to 40% of each marsh unit so as to increase their carrying capacity for canvasback and redhead duck production.
4. Avoid/minimize botulism losses.
5. Maintain water salinity levels below 5000 micromhos - - -
Alternatives:
 - a. Develop drain system to the Missouri River.
 - b. Sacrifice Black Horse Lake - operate as salt discharge unit.
 - c. Sacrifice one marsh unit - operate as salt discharge unit.
 - d. Bureau of Reclamation proposal for a surge relief dam near Power, Montana, with a discharge system through Benton Lake, Black Horse Lake, down Portage Coulee to the Missouri River.
6. Protect and make efficient use of refuge water rights.

The 1983 document also detailed in quantitative terms wildlife objectives, public use objectives and plant community objectives, all of which are primarily dependent upon successful management of the wetland resource.

Good soil moisture buildup in the fall of 1985 plus a good snow pack followed by mild weather and an early spring started runoff into the refuge in January. Severe winter weather prevailed from February 5 to 22 then turned into a very strong warming trend with chinook winds. Rapid runoff the last week of February briefly topped the Unit 1 dike as spillways and outlet structures couldn't accommodate the inflows. Nearly 3500 acre feet of water from runoff was received in February. Spring runoff ended by mid March. Strong winds coupled with warm temperatures opened the marsh units and by the fourth of March only a little ice remained windrowed along down wind shorelines.

The weather took another drastic change in mid April going from 60 to 70 degree weather, which had triggered leaf sprouting on shrubs and trees, to a blizzard with 30° temperatures - killing back trees and shrubs in this area. The marsh units froze over solid on the 14th then opened back up on the 15th. Only a small amount of runoff occurred with this

storm. April and May provided good spring soil moisture and grasslands responded dramatically in contrast to the three previous years of drought. June failed to produce very much rain and no significant moisture was received until September when nearly three inches were received. October was dry and mild followed by wintery weather and freeze-up of marsh units the first week of November. December was mild and dry with no snowpack build up.

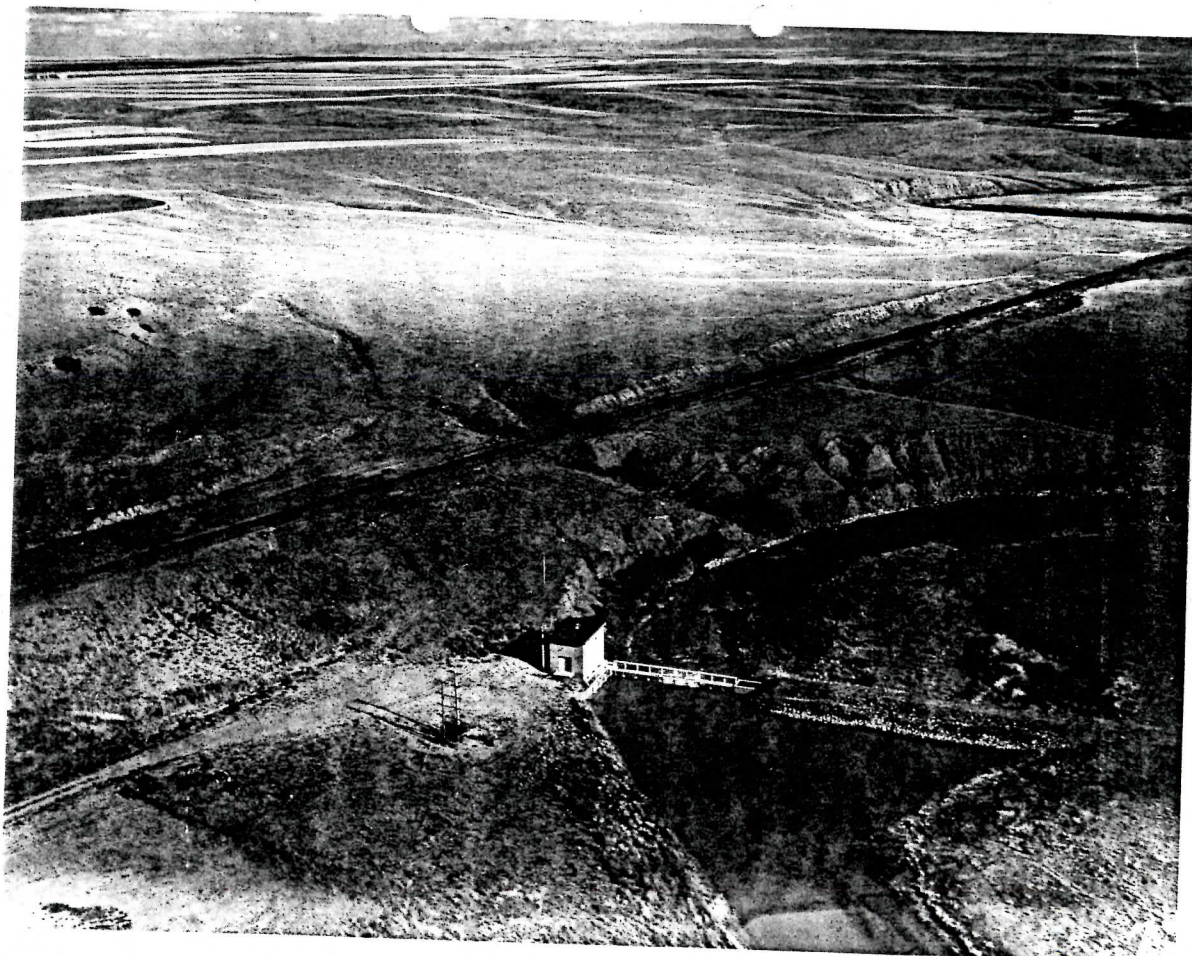


Two islands in Unit IVb and one in Unit III (1.8 acres) were constructed last winter and flooded around for the first time this spring. Unit IVc (center) showing extent of emergent development in the low basins -- primarily alkali bulrush.
86-13-37 06/20/86 DLO

Water supplies this spring were more than planned for with the refuge receiving over 4700 acre feet of runoff waters into the units. Water management entailed distribution of the excess volumes into Unit III and later distribution back into the lower units to maintain desired levels and to once again dewater Unit III for planned construction work.

The pumping station near Power, Montana, was activated in August and September with all three pumps being used to provide an additional 3300 acre feet of water to refuge marshes. Several factors including lightning storms, equipment failure, power supply failure and inadequate water supplies caused inefficient pumping operations and resulted in an end of the year shortage of about 800 acre feet of water in the marsh units as well as one of the highest costs per acre foot for water pumped (\$8.66). Two items are needed to significantly improve pumping

This multimillion dollar facility is located 28 miles west of the refuge. The dam and pumphouse are located on Muddy Creek near Power, Montana. The three 350 horsepower electric pumps elevate water 140 feet through a five mile 48" (I.D) concrete pipeline over the divide into the Lake Creek Watershed where it then follows a channelized creekbed into Benton Lake. The pumping station has supplied about 7000 acre feet annually to maintain our productive waterfowl habitat. Refuge personnel set up, maintain, operate and disassemble the unit annually and make at least three trips per week to inspect and service the pumping station. At current electrical rates, our electrical costs should be about \$6,00 per acre foot.



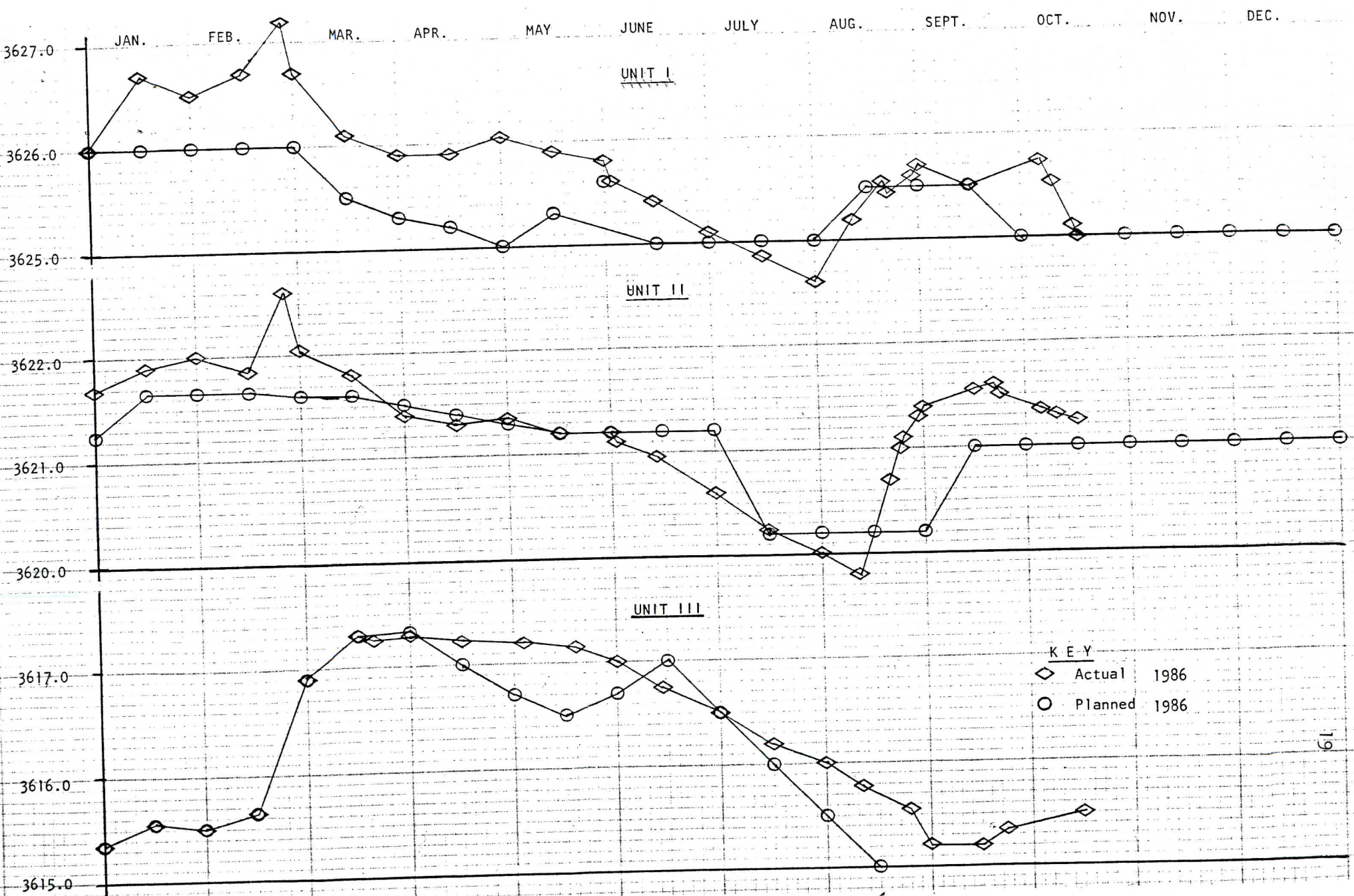
efficiency: 1) An electronic monitoring system with indicator lights at the office showing whether each pump is on or off. 2) One pumping unit with approximately one-half the pumping capacity of the existing units. This would help us reduce down time and more closely match pumping with available water supplies. The pumping station is located thirty miles west of the refuge and pumps are serviced three times a week during pumping operations.

The following tables illustrate line graphs of the 1987 planned and actual water levels in the eight marsh units. Total wetland habitat available varied from about 3500 acres in January to a peak of 5000 acres in early April. Water levels declined to a low point in August of 2800 then increased to 4000 acres by freezeup in early November. The 1986 Water Use Report provides a more detailed record and can be found in refuge and regional files.



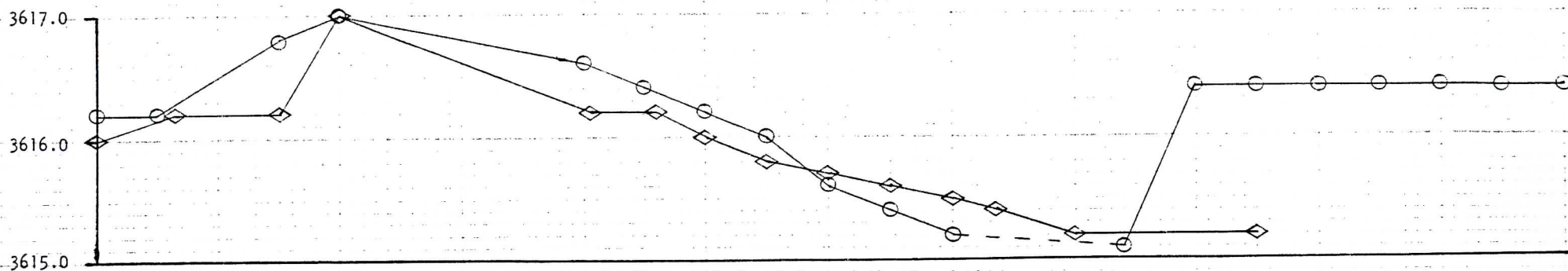
Aerial view of the new Ducks Unlimited unit (IVb). Unit II is on the right. Two or three of the old push up islands can be seen and give perspective in size for the larger islands (1.75 and 3.26 acres).
86-13-13 06/20/86 DLO

Following completion of initial construction work on the Ducks Unlimited marsh development project, Unit IVb, refuge crews spent considerable time and effort to establish cover on the two islands (in IVb) and along the unprotected outer slope of the new dike (8150 feet). Farm equipment was used to drill in a standard DNC mixture of grass and legumes on these areas in February. (Photo 86-8-22).

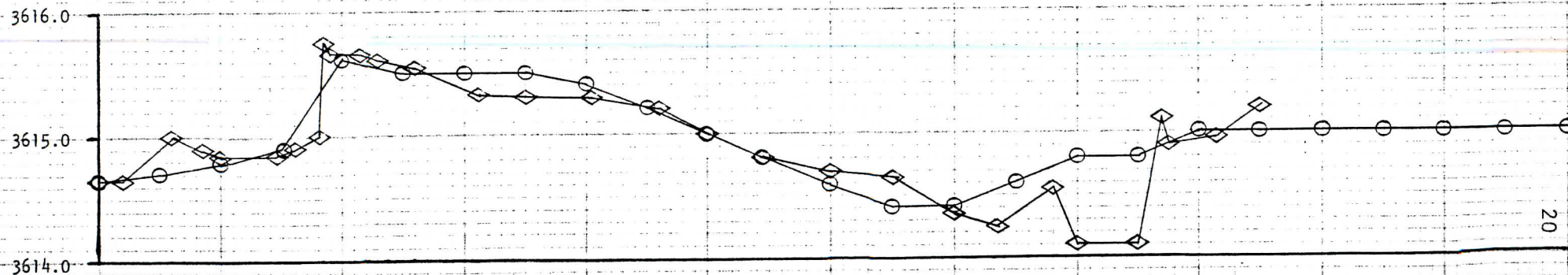


JAN. FEB. MAR. APR. MAY JUNE JULY AUG. SEPT. OCT. NOV. DEC

UNIT IVa



UNIT IVc



JAN.

FEB.

MAR.

APR.

MAY

JUNE

JULY

AUG.

SEPT.

OCT.

NOV.

DEC

UNIT IVb

3618.0

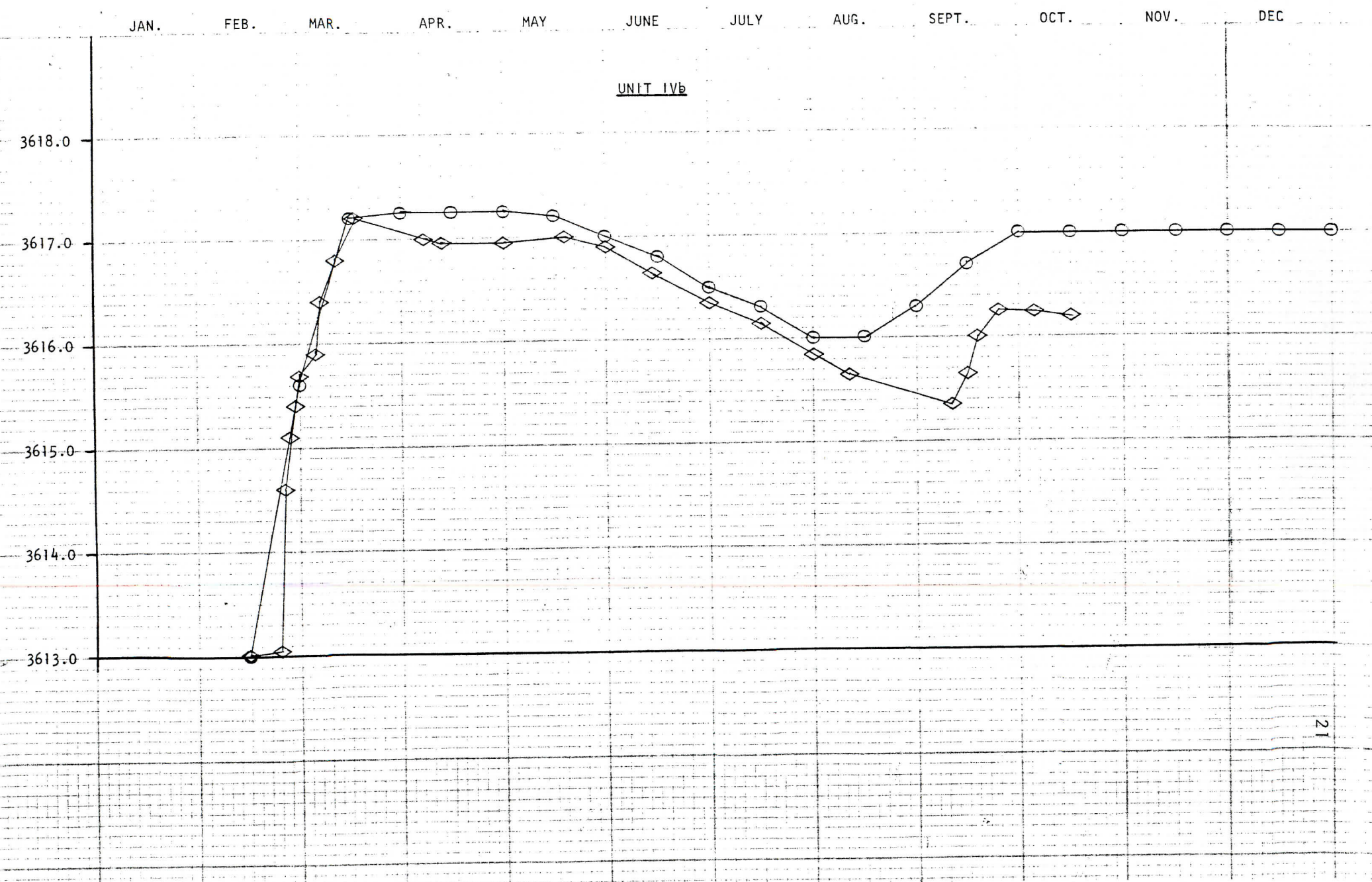
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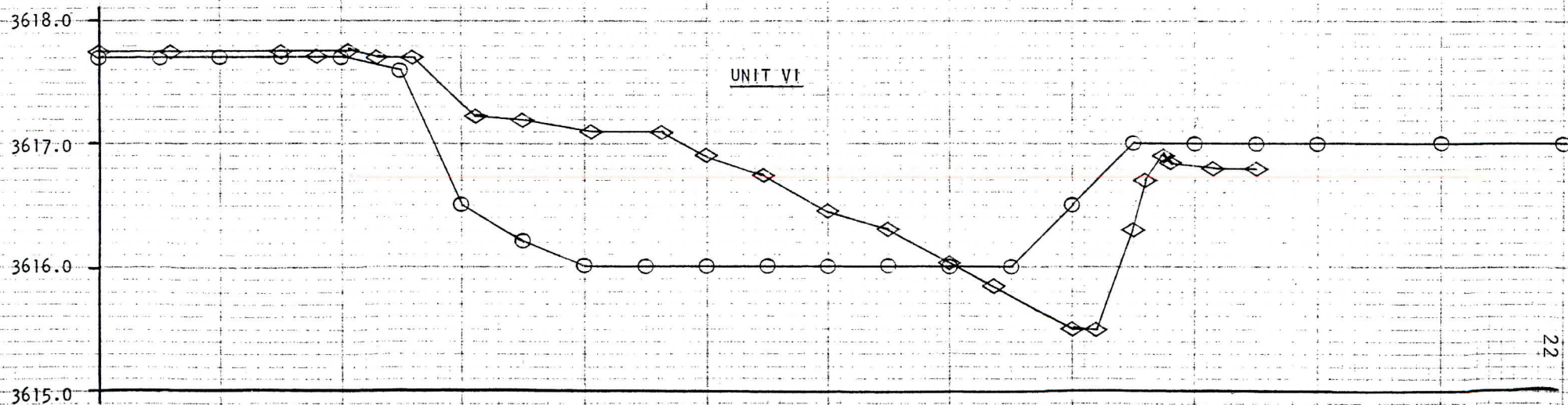
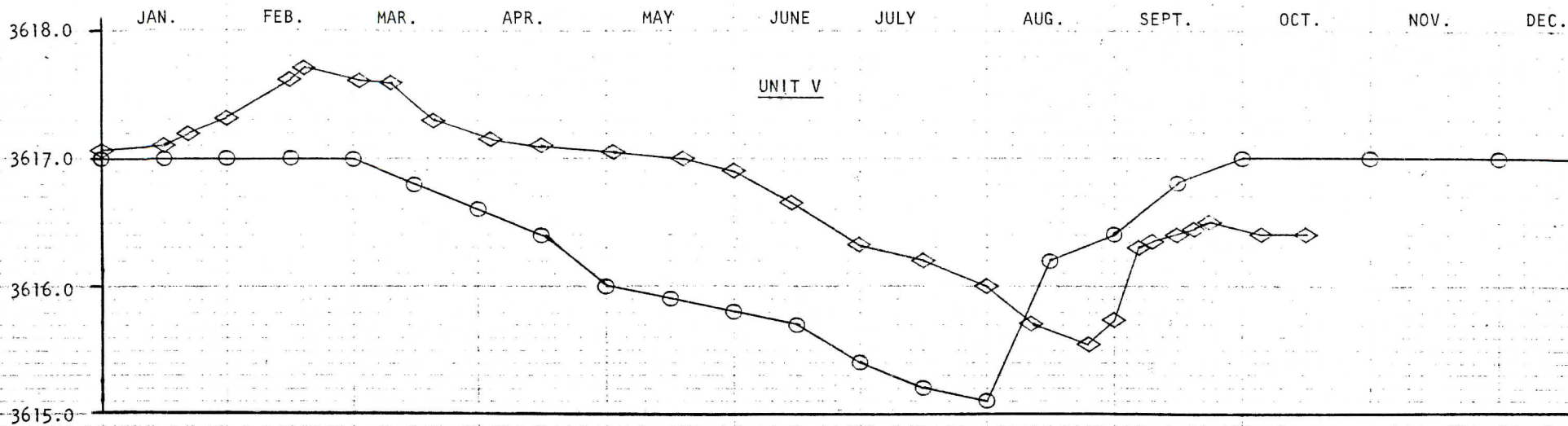
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Win some, lose some - sprinkler irrigation after redrilling the IVb
dike slope produced little results.
86-8-22 08/86 DLO



The DU island in Unit III showing volunteer plant growth. This
island was not planted last winter.
86-15-17 08/12/86 RLP



Extra efforts were undertaken to establish nesting cover on the two islands in Unit IVb. Farm equipment was used to drill tall wheatgrass, alfalfa and clover prior to flooding the unit.
86-17-37 10/16/86 BP



The southwest island cover development in Unit IVb. Spring moisture was good and some sections of this 3.26 acre island showed good results with both planted and volunteer species.
86-17-33 10/16/86 BP



Wild rosebush was transplanted into strip plots on the two islands, hand reseeded with grass and legumes, then mulched with straw and sprinkler irrigated this summer by YCC and seasonal employees.

86-17-21

10/16/86

BP



Cover development on the northeast island in IVb showing the end to end view. We predict some very high duck nesting densities and hen success rates as soon as this cover matures in the next couple years.

86-17-27

10/16/86

BP

Natural emergent growth development in IVb showed early successional plant species. What surprised us this year was the emergence and flowering of Canadian thistle in the deeper portion of this unit.



A view from IV dike looking along connecting channel toward the north island in the DU unit. "Emergent" cover on either side of the channel turned out to be Canadian thistle.
86-15-30 08/12/86 RLP

A good first year stand of spikerush developed in the intermediate water depth central portion of Unit IVb. See photo 86-16-9 further back in this section. The only cattail development in IVb was regrowth from an old stand along the deepened borrow ditch. It hadn't had water since 1980 from the flood water of 1979. A vigorous stand of forbs developed on the spoil from this excavation. Duck nesting density jumped from 1.5 to 7 nests per acre in the shoreline habitat sample near this canal. The 12 acre sample plot contained 85 duck nests in 1986.

Emergent cover developed nicely this year in Unit V with alkali bulrush dominating. This unit was dewatered in 1983. Canal and island developments were undertaken in 1984 and partially reflooded in 1985. We find no previous notations of alkali bulrush stands in this unit. The marsh started the year as flooded weeds and foxtail. Over 500 eared grebe nests could be counted in the weed stubble this spring. The bare soil islands provided excellent avocet nest sites with as many as ten nests counted on a single small island. One Canada goose and one duck nested on these "bare" islands. Grass and forbs developed rapidly on these islands this summer and should provide much improved duck nest sites though less attractive to avocets this coming year.



Cattail (dark green) along the borrow ditch below Unit II dike. This ditch was excavated an added two feet deep by DU to form a moat around the entire Unit IVb. A heavy stand of forbs developed on the spoil area (left side of canal).
86-14-38 08/86 RLP

Marsh Unit VI was dewatered in 1981, islands and canal developed in 1982 and the unit reflooded in 1983. This unit had previously been dominated by spikerush which is a weak emergent that seldom retains much residual cover past late fall. In 1983 this unit developed an emergent cover of 60% spikerush, 10% alkali bulrush and the remainder open water. This year alkali bulrush was the dominant emergent stand with 60% coverage while spikerush only occupied 20% of the surface. Spring water levels were a little too high in this unit and the residual bulrush was not used for nest sites by Franklin gulls as extensively as it was last year. The stand expanded from about 30% surface coverage last year. No significant development of cattail or hardstem bulrush occurred in the unit and they were only present in trace amounts.

Unit III experienced reflooding then dewatering. There were no changes in 20 to 30 small clumps of hardstem bulrush. A strong production of sago pondweed occurred. The very shallow water condition was very productive of aquatic insects and proved quite attractive to duck broods as well as the marsh and shorebirds. Both spikerush and alkali bulrush started developing in perimeter areas but formed only thin scattered stands with little visual impact.



Waterfowl habitat development showed good progress this summer on Unit V
with a transition from bare soil islands and open water - - -

86-15-2

08/12/86

RLP



to moderate stands of alkali bulrush and a good cover of forbs and
grasses on the low profile islands.

86-15-27

08/12/86

RLP



Marsh Unit VI has been converted from a spikerush dominated unit to this more stable emergent cover of alkali bulrush.

86-15-7

08/12/86

RLP



Unit VI shoreline with fringe of alkali bulrush provides excellent brood cover and resting areas for waterfowl.

86-15-6

08/12/86

RLP

Units I and II contain the majority of our cattail and hardstem bulrush marsh habitat and showed no visual change in cover or production this year. Colonial nesting expanded to new levels this year by black-crowned night heron and the nesting of glossy ibis was confirmed with at least seven nests found.

The problem of massive algae blooms continued but was not quite as extensive as the last couple of years.

Artificial nesting structures have long been used to supplement available nesting sites for Canada geese and some ducks. In recent years the round "straw" bale has been quite popular. It's relatively cheap (\$10-\$15) and easy to transport into position over the ice. It's very readily used but it has a major drawback. It only lasts two to three years as an effective nest site in the marsh habitat. A variety of bindings have been used to help stabilize them. Binding twine is easily broken or cut by muskrat teeth, and birds have become entangled and died. The metal bands soon rust through, plastic banding seems to work. Some bales have been wrapped with snow fence and some by elk fence. Ice and wind action can displace the bale up against a dike or shoreline. The State tried to prevent this by driving four posts in the marsh bottom and enclosing the bale with woven wire or elk fencing. Muskrats love to tunnel through and undercut them. Some bales have tipped over destroying nests on the verge of hatching. A bale may survive one year just long enough to be tipped over, moved by the ice and become ineffective or destroyed the next spring. A new use for these straw bales was discovered in recent years. The Franklin gull colony completely removed one bale straw by straw and used it for nest material. Last year we tried to extend the longevity of the straw bale by placing it on top of our low profile islands in Units V and VI.

Dirt islands in our large open marsh units are longer lived if placed in protective coves or within cattail stands where wind/wave action and ice gouging are minimal. In 1985 increasing raccoon populations were thought to have focused in on our nesting structures and about wiped out that year's goose production. As a result of the forementioned problems, we have been looking for a better structure. The State has recently gone to the large "square" bales 4'x4'x8'. We had limited experience with two round concrete pipes (4'x8'). They were placed in the marsh in late 1982. One was successfully used by Canada geese the first year and both have been 100% occupied and 100% successful ever since. They have also been used by mallards the last two years. We acquired additional pipes (4'x4') this year and placed them in Unit IVb. We feel that if the water is sufficiently deep to prevent the raccoons from being able to jump off the marsh bottom at these structures, then they won't be able to scale the structure and get at the nests.

The inter-unit pumping system was used briefly to dewater Unit III in late July. After further consulting with Region 6 Engineering and the pump manufacturer, we were able to greatly reduce the problem of vibration and noisy pump operations at low water levels. Two different types of pump discharge reducers were built and tried. The use of the pump input flange or "umbrella" appeared to solve the problem and it allows us to operate the pump at desired low water levels.



Straw bales have become a popular method of providing additional nesting sites for Canada geese, and are frequently used by some duck species and the common tern as well. Unit III.
86-15-27 08/12/86 RLP



Though readily available and reasonably easy to place in the marsh, they break down in 2 to 3 years. Note the extensive beds of sago pondweed here in Unit III. Refuge headquarters in the background.
86-15-23 08/12/86 RLP



In order to extend the useful life of the straw bale we tried placing them on loafing islands. Franklin gulls and muskrats have badly undercut this one.
86-15-9 08/12/86 RLP



Other goose nesting structures such as this pushup dirt island (1979 origin) also deteriorate from ice, wind/wave and rodent action. Unit 1. This one also housed a mink family.
86-12-6 07/23/86 RLP



This year we are trying 4'x4' concrete pipes, with escape ramp,
to overcome the aforementioned problems. We also think they will
be relatively raccoon proof. Note spikerush development - Unit IVb.
86-16-6 08/86 RLP



Some object to the concrete surface appearance in the natural green
and brown marsh setting. Goose nesting activity was recorded on 7
of 9 such structures in Unit IVb this year. One mallard also
successfully nested in one in this their first year of use.
86-16-9 08-18-86 RLP



A YCC project undertook the task of developing a paint combination to help blend these into the natural marsh scene. Note the large rip rapped island in the background.

86-16-10

08/18/86

RLP

5. Grasslands

The refuge contains 5773 acres of short-grass prairie dominated by western wheatgrass and green needlegrass. Cattle grazing was terminated in 1976 and the range is considered to be in good to excellent range condition by SCS standards. Prescribed fire is not recommended and has not been used so refuge grasslands have been rested for the last ten years.

Some people have expressed the concern that this lack of manipulation will lead to an apparent decrease of vigor in the native grasslands, which is supposed to translate into a lesser quality habitat for nesting birds. One contributing factor is said to be the absence of large ungulate disturbance, which was a natural component of the prairie ecosystem. Steve Berlinger, RO Land Use Specialist, inspected refuge grasslands and discussed possible treatments.

Good soil moisture carryover from last fall coupled with good spring rains produced excellent growth in the grass and was the best we've seen in three years. Future grazing treatments, if prescribed, would likely involve short grazing periods and high animal impact with cattle or sheep in an attempt to simulate the free roaming herds of American bison made in past years. We are considering a small trial application of some of the theories expounded by holistic resource management proponents.

9. Fire Management

One wildfire occurred on the refuge on June 16 when a refuge neighbor tried to burn his stubble without any regard for a fire-break at the refuge boundary. The neighbor did call to inform us of the fire and the refuge fire crew was able to put it out before it had burned more than roughly one acre. No "congressional" was required of the neighbor.

10. Pest Control

Annual noxious weed control efforts using a mixture of Weedar 64 have been applied to the Lake Creek right-of-way and to the ditch areas near the Kloppel and Purdum Coulee control structures in the past, primarily for the suppression of seed production of Canadian thistle. Whitetop was spot treated early, was then given a second treatment while working on the Canadian thistle in late May. It was considerably reduced in abundance and distribution this year.



A flower patch of spotted knapweed has established itself on this small abandoned field area just south (upslope) of our Muddy Creek pumping station. County right-of-way fence in foreground - refuge boundary fence in background.

86-14-21

07/31/86

RLP

The spotted knapweed was more of a problem last year. We not only found it spread over extensive areas of the 147 acre Muddy Creek tract where our pumping station is, but also found it invading the road edges along the Bootlegger Trail. This species has invaded and now dominates massive

areas of pasture and rangeland in western Montana. Last year the refuge crew tried to spray all of it they could find and made a follow-up treatment about three weeks later. Their efforts appeared to be quite successful and it required much less treatment this year. Our efforts will be somewhat short lived though unless a more widespread community effort is mounted. The County Weed Control Supervisor has been unable to generate much response. The adjacent private pasture upslope from our pumping station remains infested. An even bigger problem is the probability that numerous seed sources will continue to persist in the Muddy Creek watershed and it is very likely that we will transport it into the Lake Creek drainage with our pumping operations.

11. Water Rights

Nancy Granger of the Montana Department of Natural Resources and Conservation was accompanied by Cheryl Willis, Water Rights Specialist, Region 6 Engineering, and Manager Pearson on a field inspection of our federal reserve water rights. No apparent problems surfaced during the inspection.

G. WILDLIFE

1. Wildlife Diversity

The marsh, prairie and DNC habitats on the refuge provide for a wildlife diversity in striking contrast to surrounding agriculture lands.

The published refuge bird list contains 175 bird species. Since its revision in 1981, twenty-two additional species have been sighted. Two new species were recorded near headquarters in 1986 - house wren and McGillivray's warbler.

2. Endangered and Threatened Species

The bald eagle and peregrine falcon were two endangered species seen on the refuge this spring and fall. Fourteen bald eagle sightings were recorded this spring and summer and three bald eagle sightings were documented during the fall migration and winter. The apparent peak population was one adult and one immature seen on March 27th.

Eight peregrine falcon sightings were recorded throughout the spring and summer while three birds (six sightings) were recorded in the fall. Use of the refuge by falcons is periodic. Sightings seem to increase following waterfowl buildup in the spring, but not in the fall during higher waterfowl numbers.

Threatened species occurring on the refuge are the prairie falcon, ferruginous hawk, burrowing owl, merlin and white-faced ibis. The burrowing owl and white-faced ibis were documented as nesting this year.

Data collected on falcons and bald eagles are recorded on a BLM Raptor Observation Card and are submitted to the Montana Bald Eagle Work Group.

3. Waterfowl

Swan

Tundra swans were first observed on February 25th when 20 were seen. A peak population of 1850 was recorded on the 10th of March. By the end of the month a majority of the swans had departed.

Mild and warm fall weather resulted in very few swans on the refuge; 89% below the 10 year average. We twice postponed a planned flight in October to survey the refuge and district for radio-collared swans, hoping the big flight would occur later. We finally cancelled in early November when winter suddenly appeared to freeze over marshes and prevent the swans from ever appearing. The peak was 300 swans on November 1st. The radio telemetry equipment was supplied by Selewik NWR who is conducting the swan study. We hope to get a second change at "their" swans next fall.

Table V shows a comparison of peak populations and use days.

TABLE V

SWAN USE DAYS - 1986

	Peak Population		Use Days		Use Days Total
	Spring	Fall	Spring	Fall	
1985	6,000	800	46,030	5,275	51,335
1986	1,850	300	43,190	1,600	44,790
% Change from '85	- 69%	- 63%	- 6%	- 70%	- 13%
% Change from 20 Year Average	+ 33%	- 70%	+106%	+ 89%	+ 27%

White Geese

Snow geese were first observed on their northward migration on March 7th. The peak number of the migration was 30,000 at the end of March. Spring use days were 106,226.

The first migrants south were observed September 27. Fall use was very light (due to weather) and peaked at 6,000 birds on November 1, compared to 37,000 on November 6 last year.

Ross' geese accompanied the snow geese on the migration north. The Ross' geese were observed in higher numbers and for a longer duration this spring. On April 30, 1986, two dark phase Ross' geese were seen -- a first at Benton Lake. Three were seen again on May 4, 1986. The total spring use days were 52,414 with a peak spring migration of 1800 at the end of April. Few Ross' geese were seen in the fall. Table VI compares previous years of waterfowl use days.

TABLE VI

WATERFOWL AND COOT USE DAYS - 1986

	Snow Goose	Ross' Goose	Canada Goose	All Ducks	Coots
1985	329,455	27,362	94,893	5,113,861	1,288,393
1986	118,936	52,773	89,960	4,510,150	606,137
% Change from '85-'86	- 64%	+ 93%	- 5%	- 12%	- 53%
% Change in '86 from 20 Year Average	+ 15%	+2042%	+137%	- 33%	- 70%

Canada Geese

The first Canada geese appeared on the refuge on February 25, with a peak spring count of 360 at the end of March. The first brood was seen April 22nd. Eighty-five nests were located on the refuge this year with approximately 80% nest success. A record 270 goslings were produced, up from a mere 32 last year. Adequate water levels providing secure nesting sites was a principal reason for the good success.

Since 1981 the refuge and surrounding area has been closed to Canada goose hunting through October. This is a cooperative effort between the FWS and the Montana Department of Fish, Wildlife and Parks. This allows protection of the resident flock until the production objective of 500 goslings per year is met.

Fall migration began in September and peaked at 1500 on October 31. Total goose use days were down slightly (5%) from last year. Warm weather in December brought about 50 geese back to the refuge briefly. A record 2825 Canada geese were counted on the Missouri River at Great Falls (12 miles south of the refuge) during the Christmas Bird Count on December 20th.

Ducks

Waterfowl began showing up as soon as chinook winds arrived in late February causing runoff to appear. By February 28th 2670 mallards and 2200 northern pintail had arrived. Pintails peaked early at 60,000 on the 19th of March and mallards at 15,250 on the 24th.

The fall migration peaked at 53,000 ducks including 18,000 mallards and 14,000 pintail on November 1st after a cold front moved in concentrating the birds. By November 3 all marshes were iced over and the exodus of all but a thousand hearty mallards was complete.

The 1986 production estimate for the refuge is a phenomenal 39,000 ducklings produced. This is the second highest production figure ever recorded on the refuge. In 1970 a 39,253 production figure was reported but has met with some skepticism. Waterfowl production at a rate of over three ducklings per refuge acre (39,000 ducks from 12,235 refuge acres) is certainly hard to visualize.

Refuge DNC fields reached as high as six nests per acre and the combined nest success in 1986 was 72.6% (NPWRC). The effort to document this production in 1986 was fairly extensive.

A 1983 study proposed by Thomas Tornow set up a nest sampling procedure aimed at obtaining reliable estimates of nest success and density in each habitat type on the refuge. This information could then be used not only to monitor the effects of management practices, but could also be expanded to provide a reliable duck production estimate.



Lesser scaup, ruddy and eared grebe broods were the most frequently observed species using Unit IVc borrow ditch areas. Note (parasitic) redhead duckling in this gang brood of scaup.

86-11-16

07/86

RLP

Two nest searches were conducted on refuge habitats on May 7 - 13 and June 9 - 19. The DNC sample is set up so that acreages searched would equal that made by one round trip with the 200 foot cable/chain drag. The acreage in each DNC field and sample size is listed in Table VII. All the DNC, native grassland and an added sample of private land stubble were sampled with a 200 foot cable/chain drag pulled by two 4 x 4 pickups. The dikes and shoreline were sampled with a straight chain of various lengths, depending on the sample size and dragged by two 3-wheel ATV's. The alkali bulrush, IVc island and circle dike were sampled by walking. Northern Prairie Wildlife Research Center nest cards were used in the collection of data.

TABLE VII

DNC ACREAGES AND SAMPLE SIZE

DNC Fields	Total Acreage	Sample Size	% Sampled
DNC-1	160.0	20.9	13.1
DNC-2	111.0	13.4	12.1
DNC-3	66.5	11.6	17.4
DNC-4	40.0	10.6	26.5
DNC-5	41.5	12.1	29.2
DNC-6	102.0	13.7	13.4
DNC-7	98.0	14.2	14.5

A total of 748 nests were found in the May and June searches. The fate of all 748 nests was recorded. Seventeen nest results were not recorded because of not being refound or were experimental nests (Dennis Orthmeyer's study). Table VIII lists sample size, acreage sampled, total number of nests found and Mayfield 40% nest success. The number of nests found was not unexpected because of good water levels early this spring resulting in increased breeding pairs remaining on the refuge; and this was coupled with the first formal nest predator control program on the refuge for many years. Sixty-five skunk and 23 raccoon were removed,

Nest success rates for each habitat type were manually calculated using the Mayfield 40% method and described in Miller and Johnson's 1978 publication "Interpreting the Results of Nesting Studies". The stratified Mayfield estimator was used in calculating the nest success rate for the seven DNC fields. This allowed the seven DNC fields to be treated as one habitat type, instead of as individual units as described in Klett and Johnson's 1982 publication "Variability in Nest Survival Rates and Implications to Nesting Studies",

By using the Mayfield 40% success rate and the expanded nest density described in Miller and Johnson's 1978 publications, a production estimate was calculated for each habitat type. The expanded nest density is an estimate of the total number of nest initiations per acre which accounts for the nests that were initiated and destroyed between searches. The expanded nest density is obtained by dividing the number of successful nests found by the Mayfield nest success,

TABLE VIII
PRODUCTION ESTIMATES BASED ON NEST SUCCESS AND DENSITIES

	DNC	Grassland	Shoreline	Dikes	Alkali Bulrush	Ivc Island	Circle Dike	Stubble	Combined
Total Acreage	669	5873	778	54	2	1.5	3	120	7,500.5
Acres Sampled	96.5	300	47	19.6	2	1.3	3	120	589.4
Nests Found	310	120	133	101	25	20	30	19	758
Successful Nests	278	103	125	73	20	14	28	7	648
Mayfield Success Rate	78.7	73.9	84.2	55.6	64	53.2	87.2	11.1	71
Nests Initiated in Sample	315	140	148	131	31	26	32	63	886
Nests Initiated in Entire Habitat	2118	2754	2458	362	31	30	32	63	7918
Number Successful Nests	1934	2035	2070	201	20	16	28	7	6311
Estimated Hatch/Pro- duction - 6 Ducks/ Successful Nest	11,604	12,210	12,420	1206	120	96	168	42	37,866

Production of ducklings by this method is 37,866. Individual species production was not calculated due to small numbers of nests found in some habitats.

Note: Samples in alkali bulrush cover and private grain stubble were informative but not used in projecting production estimates. These habitats are extensive and are utilized and produce "Benton Lake" ducks but are not easily sampled in a representative manner. Searching overwater emergent cover requires excessive manpower and a 30 acre sample block of cattail was initially included in our habitat sampling plan. The first search effort was conducted in 1985 using refuge staff and several volunteers. The results found no nests and were blamed on insufficient water levels.

The 120 acre stubble field sample was initiated on a field adjacent to the refuge entrance road. The farm operator was trying to control weeds with chemicals instead of mechanically. He accidentally left a few strips that remained green while the rest turned gray-brown. Peer pressure caused him to then go back in and mechanically rework the entire field. Our initial interest was the effects of chemicals on nest hatching rates. Even though our single nest search was too late to catch the early nesting species, it did provide us with an idea of how extensively some of the thousands of acres of private stubble fields next to the refuge are being used. Minimum till or chemical fallowing practices could prove very advantageous near Benton Lake for duck production if the chemicals used were not detrimental - vain hope.

Another weakness in the production estimate is the figure we used for the number of ducklings fledged per successful nest; i.e., 6 ducklings. Orthmeyer's study results for 1986 (D.5) indicated only 3 ducklings fledged per successful nest; mostly due to total brood loss in 35% of the broods. However, he sampled only 2.2% of successful nests and only mallards. We may eventually have to revise the "ducklings fledged" figure downward. In contrast, observations of gang broods were very common throughout the summer and large brood sizes evident.



A near record level of duck production estimated at 39,000 for 1986. Observation of gang broods was very common in several species. Note algae and relative openness of this Unit V area.
86-11-29 07/86 RLP

TABLE IX

HISTORY OF BREEDING PAIR COUNTS

Species	1976	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	% Change '85-'86	Ten Year Average	% Change '86 from 10 Year Average
Mallard	208	181	113	130	580	623	357	932	368	153	777	+408%	365	+113%
Gadwall	979	968	222	665	2068	931	1148	1622	1852	1110	840	- 24%	1157	- 27%
Wigeon	187	100	44	60	407	329	121	145	214	44	160	+264%	165	- 3%
Pintail	612	287	249	335	842	606	451	1038	625	116	1019	+778%	516	+ 97%
G-W Teal	53	103	35	34	205	69	43	32	49	42	69	+ 64%	67	+ 3%
B-W Teal	580	885	178	180	572	836	582	1152	434	254	388	+ 53%	565	- 31%
Cinn. Teal			119	60	303	236	261	249	256	275	360	+ 31%	220	+ 64%
Shoveller	488	533	245	310	1551	1918	1280	1648	792	417	1900	+356%	918	+107%
Redhead	443	233	354	100	712	393	318	260	192	74	576	+678%	308	+ 87%
Canvasback	47	43	380	55	70	61	59	120	28	6	60	+900%	87	- 31%
Scaup	362	231	537	225	1015	614	659	883	711	394	934	+137%	563	+ 66%
Ruddy	107	124	108	60	159	245	117	94	86	54	170	+215%	115	+ 48%
TOTALS	4066	3688	2585	2325	8485	6860	5608	8175	5607	2939	7253	+147%	5032	+ 44%
PRODUCTION	21,750	10,556	7,930	11,520	31,350	21,780	18,092	28,894	18,100	6,601	39,000	+491%	17,657	+121%
Available Water - Sur. Acres - May	4545	2741	6001	5982	5000	3966	4077	4041	2938	1815	4660	+157%	3929	+ 19%

does this include
Geese production?
it shouldn't!

Factors involved in the increased duck production in 1986 go beyond the amount of water available on the refuge. As shown in Table IX, a 157% increase in water from 1985 to 1986 resulted in a 491% increase in production; while a 19% increase in water over the ten year average resulted in a 121% duck production increase. We're seeing a local build-up of a breeding population on a small amount of habitat. (Note: Consistently high nesting success coupled with homing behavior of female ducks - RLP)

Table X provides a breakdown of species nesting use of the various refuge habitats. Similar to previous years, DNC accounts for only 8.9% of the nesting habitat but 41.4% of the nests. A total of 310 nests were found on 96.5 DNC acres.

TABLE X
SPECIES BREAKDOWN BY HABITAT

	DNC	Grassland	Shoreline	Dikes	Alkali Bulrush	Ivc Island	Circle Dike	Stubble	Combined
Mallard	*11(2)	2(2)	18(18)	22(15)	7(4)	7(4)	4(4)	0	71(49)
Gadwall	138(126)	24(22)	37(34)	23(22)	2(2)	3(3)	4(4)	2(0)	233(213)
G-W Teal	2(2)	0	4(3)	3(2)	1(1)	0	4(4)	0	14(12)
B-W/Cinnamon Teal	15(15)	6(5)	8(8)	8(7)	1(1)	0	4(3)	0	42(39)
Shoveler	53(46)	30(27)	25(24)	16(13)	1(1)	1(1)	3(1)	8(5)	137(119)
Pintail	68(61)	36(35)	21(20)	17(5)	5(5)	1(1)	2(2)	8(2)	158(131)
Wigeon	8(8)	2(2)	3(3)	0	0	1(1)	0	1(0)	15(14)
Redhead	6(5)	0	4(3)	1(1)	5(3)	3(1)	4(4)	0	23(17)
Lesser Scaup	9(7)	10(10)	13(1)	11(8)	3(3)	4(3)	5(5)	0	55(37)

* Number of nests in which fate was determined
() Number of successful nests

Breeding pair counts (single count) were conducted again in 1986, although results were not used in the production calculation. We've been reluctant to let the 20+ years of pair count coverage and data lapse. This year's data provided an interesting comparison between the percent species composition of breeding pairs versus initiated nests found (Table XI).

For some species; i.e., mallard, n. pintail, A. wigeon, their relative abundance in the breeding pair population was closely reflected in their relative abundance of initiated nests and the eventual production figure. However, the gadwall and green-winged teal appear to be underrepresented in the breeding pair count. For instance, using the production estimate of 12,782 ducklings, 6 ducklings per successful nest and .86 calculated (NPWRC) Mayfield hatch rate, 2477 gadwall pairs should have been counted to account for the estimated production.

Similarly, 153 green-winged teal should have been counted (.783 Mayfield hatch rate). That we may miss half of the green-winged pairs during pair counts was expected; missing 2 out of 3 gadwall was not. We have suspected though, that a later flight of gadwall into the refuge occurs.

As a check of the production figures we calculated a "theoretical hen success" rate based on pair counts; i.e., the hen success necessary to achieve the estimated production from the breeding pair counts. The overwater nesters like scaup and redhead, for which the nest searches ignored their nest habitats, showed a lower theoretical hen success than the actual observed (scaup = 77.5%; redhead 62.6% (NPWRC). Production estimates may actually be too low for these species.

Estimating production from pair counts has always been questionable. However, we feel that by sampling each habitat type and setting up permanent sampling sites, a more reliable production estimate was made in 1986 based on nest success and densities by habitat type. In other words, the 39,000 ducklings produced in 1986 were not paper ducks.

TABLE XI
BREEDING PAIR - SUCCESSFUL NESTS COMPARISON

	Breeding ¹ Pairs	Percent ² Breeding Pairs	Percent ³ Initiated Nests	Production ⁴ Estimate	Theoretical ⁵ Hen Success	Mayfield ⁶ Hatch Rate
Mallard	767	9.9%	9.5%	2,940	63.9%	60.0%
Gadwall	850	11.0%	31.1%	12,782	250.6%	86.0%
N. Pintail	1500	19.3%	21.1%	7,862	87.4%	47.9%
G-W Teal	75	1.0%	1.9%	720	160.0%	78.3%
B-W/Cinn. Teal	700	9.0%	5.6%	2,340	55.8%	84.8%
Am. Wigeon	150	1.9%	2.0%	840	93.3%	73.5%
N. Shoveler	2000	25.8%	18.3%	7,142	59.5%	76.3%
Redhead	500	6.4%	3.1%	1,020	34.0%	62.6%
Canvasback	60	0.8%	-	(302) ⁷	83.9%	3.7%
L. Scaup	1000	12.9%	7.4%	2,220	37.0%	77.5%
Ruddy	150	1.9%	-	(832) ⁷	92.4%	-
TOTAL	7752			39,000		72.6%

1 A single breeding pair count

2 Relative abundance in the breeding pair survey

3 Relative abundance in the total number of located nests

4 Calculated by multiplying the total ducklings produced (Table VIII) by the relative abundance of successful nests

5 The estimated production estimate, divided by six (ducklings), and divided by the number of observed breeding pairs

6 Calculated by NPWRC from nest cards

7 Estimated from pair counts, no nest data available

Coots

Coots were observed on March 4 on their emergence from the mud. Production was roughly estimated at 2800 this year. Spring migration numbers were lower this year with the peak number of 2000 in April. The fall migration started building up in September with a peak of 21,000 on October 9.

4. Marsh and Water Birds

Much of the information on nesting birds in this section is collected and reported as part of the Colonial Bird Registry survey. Nesting colonies were visited once in June and 7 white-faced ibis nests and 34 black-crowned night heron nests were counted. Over 500 eared grebe nests were counted in marsh Unit V.

Other species nesting on the refuge this year but for which numbers of nests were not counted included sora, pied-billed grebe and double-crested cormorant. Broods and young of these species were observed on the refuge throughout the summer. Species seen on the refuge but not documented as nesting included; western grebe, great blue heron, American bittern and American white pelicans. Sandhill cranes were observed on two different occasions this spring on the refuge.

5. Shorebirds, Gulls, Terns and Allied Species

The June colonial bird survey located 755 California gull nests in Units IV, V and VI.



Staging area for young Franklin gulls as they develop flight capability near the main nesting colony on Unit IVc. Franklin gulls built an estimated 22,200 nests on the refuge this year. Note the developing stands of cattail.

Franklin's gull colonies were sampled for density estimates and size. Three 10,000 square foot samples were taken in Unit IVc. The colony size was estimated at 97 acres and contained an estimated 22,200 nests in three colonies; down from the last two years.

Thirty-eight common tern nests were located on 2 islands in Unit VI. Other shorebirds which nested successfully this year were the American avocet, Wilson's phalarope, marbled godwit, upland sandpiper, willet, killdeer and black-necked stilt. Black-necked stilts nested in Units V and IVa. A single black tern nest was observed on Unit V.

6. Raptors

Northern harrier, short-eared owl and Swainson's hawk were known nesters on the refuge this year. Besides the endangered and threatened raptor species previously mentioned, other raptor species observed on the refuge this year included the red-tailed hawk, rough-legged hawk, golden eagle, great horned owl, Cooper's hawk, sharp-shinned hawk and gyrfalcon.

8. Game Animals

White-tailed and mule deer use on the refuge has been steady in recent years. White-tails use the cattail areas and mule deer use the tree belts and DNC fields for fawning areas. Neither species wintered on the refuge this year due to the record cold November - second coldest month on record since the 1890's.

Pronghorn use on the refuge is intermittent. One small group consisting of one buck, two does and three kids was seen on the refuge throughout the summer.

10. Other Resident Wildlife

The winter of 1985 had a serious effect on ring-necked pheasant populations. Pheasant crow counts made this spring averaged .4 calls per station compared to 3.0 in 1985, 2.5 in 1984 and 3.9 in 1983. Gray partridge numbers remained low again this year but were up slightly from last year. Sharp-tailed grouse are suspected of nesting, but no nests or broods were observed. This species has never been abundant on the refuge with one or two birds the usual observation - peak numbers seldom exceed one dozen.

The refuge again participated in the national mourning dove call count. The survey routes are in Chouteau and Toole Counties. Data from the 20 mile transect are sent to Laurel, Maryland, for compilation. This is the first time the Toole County route has been run by the refuge. It resulted in one dove observed at an isolated rural residence. We strongly recommend against rerunning this route - travel, per diem and salary costs don't justify it. The habitat is such that doves should continue to avoid the area.

Other resident wildlife, besides the necking couples along the tour route, include rattlesnake, garter snake, white-tailed jackrabbit, cotton-tailed rabbit, coyotes, badger, skunk, raccoon, mink, long-tailed and least weasels, muskrat, yellow-bellied marmot and most abundant, the playful and humorous Richardson's ground squirrel. They are the biggest fans of the manager's and assistant manager's gardens and are good for at least one complaint from neighbors annually.

15. Animal Control

Action under the control program for California gulls was more extensive than normal this year due to displacement of thousands of gulls from the State area. They are making a concerted effort to reduce their extensive gull colony of 20 to 30 thousand birds; they likewise want to improve waterfowl production and brood survival.

A predator control study program directed towards evaluating the interrelationship between duck nesting success and predator removal (skunks and raccoons) was initiated this year. Trapping began on March 1st and was terminated on July 15th. Trap density and placement was determined in March with emphasis on or near DNC fields, dikes and shelterbelts. The dikes and shelterbelts serve as travel lanes for predators. The maximum number of traps set was 58 conibear 220 cubby sets, 12 large live traps (36" x 15" x 15") and 6 small live traps (18" x 6" x 6"). Live traps were used near the tour route to reduce the possibility of injuring the public or pets. The 220 conibear sets were placed in prairie duck nesting habitat in closed areas of the refuge.

Sixty-five skunks and 23 raccoons were removed during 9,175 trapping days. Incidental species caught were 8 Richardson's ground squirrels, 1 badger, and 1 feral dog. Twenty-man days were expended for the trapping effort. Most traps were placed so they could be checked during daily activities.

The results are reflected, at least partially, in the nest success documented this year. The overall Mayfield duck nest success was 72.6%, compared to 34% in 1985.

16. Marking and Banding

Ducks of the "National Species of Special Emphasis" persuasion were again banded this year. A total of 1927 ducks were banded, of which 1427 were mallards, 457 were pintails and 43 were redheads. Table XII gives the results for 1986 banding efforts. Six Colorado Salt Plains traps were used for 170 trap days during 30 calendar days. Loss of personnel due to transfers and disability caused a reduced effort this year.

TABLE XII

1986 DUCK BANDING AT BENTON LAKE

Species	Age/Sex				Total	% Species Composition	% HY
	AHY-M	AHY-F	HY-M	HY-F			
Mallard	479	198	446	304	740	74%	53%
Pintail	54	52	187	164	457	24%	77%
Redhead	0	0	19	24	43	2%	100%
Total	533	250	652	492	1927	100%	

17. Disease Prevention and Control

Weekly patrols by airboat in the marsh units, starting in late June, kept close watch on botulism. Hot spots in each unit are checked as well as the entire unit. Clean-up operations are done to stop the carcass/maggot cycle, Table VIII summarizes and compares previous years' botulism losses to this year's.

TABLE XIII

BOTULISM LOSSES AT BENTON LAKE

Year	Unit I	Unit II	Unit III	Unit IV	Unit V	Unit VI	Total
1970	603	1365	5197	9098	3405	1841	21,419
1971		927	6295	2212	2627		12,061
1972	34	45	402		2964	6760	10,205
1973			1665		95		1,760
1974			986				986
1978*	65	2	24	719			810
1979	11	25	13	1017	19	63	1,148
1980		12	32	71	419	1272	1,806
1981*		10	15		15	10	50
1982	57	690	43		10		800
1983	11	62	61	170		10	314
1984	25	187	434	137		185	968
1985		116		34		59	209
1986 **	13	23	8	16	72	23	155

*No botulism losses were recorded in either 1975 or 1976. A scattering of badly decomposed duck carcasses were noticed in the fall of 1977 -- cause of death was suspected to be botulism. In 1981 the weekly cleanup operations picked up 50 birds -- cause of death unknown.

**In addition to ducks, losses include coot, eared grebe, California and Franklin's gull, avocet, yellow-headed blackbird and muskrat.



Lead poisoning apparently was the cause of death in this spring migrant. The Ross' goose carcass was salvaged and mounted for office display and I & E purposes.
86-9-37 05/06/86 RLP

Of significance this year, lead poisoning-wise, was the requirement that only steel shot could be used in refuge hunting programs. No change was noted in numbers of waterfowl cripples or carcasses during fall surveillance of the marsh units.

H. PUBLIC USE

1. General

The refuge tour route is open to visitor use during daylight hours except during the winter months. The refuge was opened to the public on March 7th this year. A nine mile tour loop allows visitors to view three of our six water units surrounded by native prairie and contrasting DNC fields. We have no interpretive facilities at this time. A refuge leaflet and bird list are available. A tour route leaflet was drafted and will be printed next year. The wildlife drive will include signs at 10 refuge stops on the loop.

2. Outdoor Classrooms - Students

The Great Falls School District conducts field trips to the refuge for the third and seventh grades. School district environmental education instructors have developed an excellent program covering invertebrate life, ornithology and botany. All students in the 3rd and 7th grades are brought out to the refuge once a year. The screams of the third graders "look at dem bloodsuckers" and the reserved awe of the 7th graders makes us appreciate what we sometimes take for granted. A total of 1600 students and 40 frazzled teachers took part in this program.

We are looking at shifting part of this concentrated use to the fall period to reduce disturbance to nesting birds.

Refuge tours were also conducted for the Lady of Lourdes School, Cub Scouts, Great Falls Continuing Education, Carter, Benton Lake and Knees grade schools and the Denton 4-H Club. This is the most interest we've had in conducted tours for many years.

7. Other Interpretive Programs

Conducted tours and discussions of Benton Lake operations were given to individuals representing a variety of organizations:

- Upper Missouri Breaks Audubon Club
- Ron Skates and Bruce Haines, Creston NFH
- Frank Feist, Freezeout Lake WMA
- Conrad Garden Club
- Dick Engberg, USGS
- Jack Sutphin, Bureau of Reclamation
- C.M. Russell NWR personnel
- Ken Fox, Marshall Fox, Dewayne Deaver, Denver Engineering

Benton Lake personnel made off-site presentations or made contacts with the following:

- Upper Missouri Breaks Audubon Club
- Northern Prairie Wildlife Research Center
- Kleinschmidt Lake Mitigation Committee
- Marias River Weed Action Committee
- Cascade County Commissioners
- Western Area Power Administration

Local Congressional offices of Senator John Melcher and Representative Ron Marlenee
 Ducks Unlimited
 Army Corps of Engineers
 Great Falls Tribune
 Sacramento Bee News
 KRTV
 Cub Scouts

8. Hunting

Several preparations for the refuge waterfowl hunt were made including: posting, information signs erected, hunter bulletin boards stocked, parking areas mowed and hunter information/regulation handouts prepared. Manager Pearson contacted the Great Falls Tribune and initiated an article about the refuge steel shot zone and other refuge regulations. A meeting with Montana Fish, Wildlife and Parks personnel was held regarding steel shot enforcement and the sale of the state's first waterfowl stamp. As a service to hunters, both the state and federal waterfowl stamps were available at the refuge during the season.

The refuge's first waterfowl hunting season requiring steel shot went well with apparently good hunter compliance. During the opener, 138 hunters took 381 birds or 2.76 birds per hunter. Hunters had generally good success throughout the first month despite the warm sunny weather. Total count for October was 794 hunters who took 1047 ducks. The program came to a quick halt when the marshes froze on November 1 and 2 causing the quick exit of waterfowl and hunters.

Hunting was not allowed for gray partridge or pheasants due to low numbers of these species.



Sunrise silhouette of a duck hunter on the left end of the small island in Unit V with decoys in the water near the opposite end of island and live birds in foreground - - awaiting legal shooting hour.
 86-17-19 10/04/86 RLP

11. Wildlife Observation

Approximately 7000 people drove through the wildlife tour loop this year. Viewers are attracted to the concentrations of waterfowl during the spring and fall migrations as well as the opportunity to see plentiful waterfowl broods, especially in July.



Our official greeter along the visitor tour loop. This yellow-bellied marmot resides in the rip rapped outlet of Unit 11.
86-9-26 03/86

RLP

12. Law Enforcement

Most of the refuge law enforcement activity is centered around the waterfowl hunting season. Both refuge law enforcement officials worked weekends during the first few weeks of the season. An effort was made to make as many steel shot compliance checks as possible. We estimated we made contact with 76% of all refuge hunters on the opening weekend. No hunters were found to be using lead shot, although one hunter was found in possession of lead shot in his vehicle.

Two violations occurred for which FOC's were issued. The first involved a hunter shooting 19 minutes after the legal hunting hour; he paid the \$88.00 fine. In the second case, a party of three hunters with combined over-possession of redheads (8) refused to cooperate and distribute the take. An FOC for a mandatory court appearance was issued to all three individuals. Once in court the men proved more cooperative - two paid fines of \$75.00 each and the third was found not guilty.

Warnings were issued to nine individuals during the hunt season for possible violations or violations lacking sufficient evidence.

A new taxidermy business near the refuge called with concern about a large bear hide. The taxidermist was unsure whether the bear was a black or a grizzly and wanted it identified.

SRA Hanlon was out of town so Manager Pearson made initial contact, took information and photos and then referred the case to Hanlon. It turned out to be a large black bear without head or feet, but it had been taken without a license.



The local taxidermist requested identification of this bear skin - what is it? A case was made!
86-17-8 10/08/86 RLP

I. EQUIPMENT AND FACILITIES

1. New Construction

Work by private contractors was completed on three projects this year.

- a. Lake Creek Structures - - A 1984 contract to build three drop inlet diversion structures was finally accepted with minor touch up work undertaken. The refuge is now left with broken and cracked concrete structures that were poorly built and incorrectly designed. When the Government "system" awards a formal contract to an unknown contractor - - who is unconcerned about product quality then the system breaks down and you end up with a product that's "good enough for government work". CGS and Engineering apparently are unable to prevent or enforce this from happening. Project leaders must therefore be given 1) adequate training for project inspection duties; 2) more authority to shut down and amend contract activity; or be faced with major rehabilitation of faulty products.
- b. New Cold Storage Building (40' x 155') - - The 1985 contract was extended to allow final concrete work to be done without special protective measures. Final inspection was conducted by Engineer Ken Fox on March 27. Punch list items were satisfactorily completed on May 23. It was a good change to work with a cooperative and conscientious contractor.

The refuge then finished grading, sloping and gravelling the building site to provide positive water runoff and to tie the building site into the main headquarters courtyard. Ungravelled slopes were seeded to grass in July. The design problem with the overhead doors was solved by placing 10"x10"x12' timbers along the entrance apron and footing to form a uniform sill for the doors. A butyl caulk was used to seal out water runoff from the overhead doors getting between the slab floor and the foundation.

- c. United Materials of Great Falls completed the DU project (Unit IVb) - - When they pulled the borrow ditch plugs near the outlet structure they discovered a leak and had to excavate and reset several joints of arch pipe. They completed the deepening of the Unit II dike borrow ditch, delivered and placed road gravel on top of the 8150 foot dike and the final inspection was completed on January 29, 1986. In this day and age it's unusual in government work to be able to plan and complete a construction project of this nature (\$600,000) in less than one year's time. The initial project was drafted and submitted in March, 1985.

The refuge crew followed up on this project with haul road repairs, finish work on two new parking areas, built an airboat ramp and an ATV bridge across the moat for habitat survey work. In accordance with the construction agreement with DU, the refuge expended considerable effort to establish cover on the islands and dike slope.

- d. The refuge placed a new concrete structure on our main water delivery system this year. Hopefully this will resolve several problems for us as well as for the two private landowners. The boundary fence crossing the channel would act as a dam, catching debris and weeds. Flood waters or our backhoe would take out the fence span. Cattle would find their way into the neighbor's wheat fields. So far we have gained some positive "PR" with the neighbors and our weed problem appears to be resolved using a swinging cable gate on the down stream end to allow weeds to pass but exclude cattle.



Rehab and Public Relations - - - and Problem Solving. An annual problem of boundary fence maintenance (private), cattle trespass and ditch plugging with weeds on our main water supply system led to another problem.

86-14-2

07/28/86

RLP



This six foot diameter concrete pipe sections weighing 14,700 pounds couldn't be lifted and set into position with refuge equipment.
86-14-9 07/28/86 RLP



Three eight foot sections were rolled into position, joints sealed and imperfections on concrete outer surface patched. Backfill and compaction was a problem due to extremely dry powdery soil conditions.
86-14-17 07/30/86 RLP



Due to the acute need for water in the refuge marsh units, the Muddy Creek pumping system was turned on prior to completion of rip rap placement, fence reconstruction and placement of cattle excluder, 86-15-34 08/16/86 RLP

- e. The most administratively challenging construction project this year was the domestic water system. We installed 2 3/4 miles of 1 1/2 inch plastic pipe connecting the refuge headquarters cistern to a private water association. This eliminates the need for us to haul our domestic water in from Great Falls.

A private contractor was hired to excavate the trench (14,200 feet) to a minimum of six feet deep for \$5000 (.35 per foot). The refuge installed the pipe and backfilled the trench. A local contractor was hired to bore under the state highway in order to avoid cutting through the pavement. We then used his equipment to make several additional borings under driveways, telephone cables and a large natural gas transmission pipeline. Connections and fittings at both ends of the pipeline were in accordance with specifications of the Tri-County Water System and were installed under their direct supervision.

We had applied to get onto this water system in 1981 but due to the fact that we were a federal agency instead of a rural ranch operator, we were not considered until all other applicants had been satisfied. Two of the water use contracts (20 year) became "available". We had to negotiate with the private individuals to get these assigned to us. We negotiated rights-of-way with three landowners, a trust department and in lieu of a right-of-way easement we were issued an encroachment permit from the Montana Department of



Ron Wynegar using the new high pressure water and steam cleaner on a pallet of 1½" x 20' PVC pipe. A 2 ¾ mile pipeline was installed to provide a domestic water supply to the headquarters cistern. Note new equipment storage building in background.
86-17-2 10/07/86

RLP



Vince Marko with contractor beginning the boring to place an oversized pipe (PVC) under the State Highway #225. Our new water pipeline was buried at a minimum of 72" depth. Routing was parallel to the overhead powerline that services refuge headquarters.
86-17-4 10/07/86

RLP



Wheeled trencher attempting the second sweeping curve along the headquarters shelterbelt - and several more equipment breakdowns. Looking west.

86-18-13

11/06/86

RLP



Ron Wynegar, refuge laborer, rotates coiled pipe into the 6 foot deep trench at the first curve. Note contractor's repair truck - site of previous equipment breakdown. Looking east.

86-18-14

11/06/86

RLP

Highways, after convincing them that they owned the land. A tenant disclaimer was obtained from an unfriendly tenant. Letters of concurrence were obtained from all affected utilities and onsite locations marked. When the contractor's equipment arrived on site (October 30th) to begin excavation we were informed that the right-of-way along the county road shoulder (slope) was impractical for his equipment. With a ten day performance specification and winter setting in, we had to renegotiate the right-of-way location. Thankfully, after a little smoke, verbal clearance was obtained and the construction proceeded and it was a race to get it plumbed in before frozen ground became a significant problem. The wheeled trencher broke down repeatedly on the final 1000 feet of trenching and we finally had to complete the job with the refuge backhoe and rented ditch witch. The construction began on October 30th and was mostly finished by the 14th of November. The system was flushed out, chlorinated and tested by the end of November and inflows to the cistern began on December 2nd. The system delivers 2 gallons per minute (2 shares) to our cistern (4500 gallon capacity). No problems have been experienced with the new delivery system. Now if we can get the revised easements signed, notarized and recorded without further problems, it'll be great. Support from the Regional Office to bring this project to completion was invaluable, special thanks.

- f. The Unit IV interunit pumpsite was reconstructed using the same concrete vault design used on the other three pumphsites. This work was undertaken in August. The old wooden bulkhead was removed, site excavated, the base and two separate "pours" made forming the 8 foot by 8 foot by 16 foot deep structure. Support I-beam frames were cut and installed. The entrance basin was formed and slopes were stabilized with heavy rip rap. Twenty inch discharge pipes were installed under the dike roadways at both Unit III and IV pumphsites. All four pumphsites are now functional. The decking and guard rail have yet to be completed on the Units III and IV pumphsites and the rip rap needs to be placed on the Unit III entrance basin slopes.

2. Rehabilitation

A malfunctioning wood stove in Quarters 81 (Add-a-furnace) was replaced with a Blaze King. The triple wall chimney was also replaced with a brick chimney. Both residences are now similarly equipped and the units are working well. The light plywood garage doors were replaced with insulated metal doors and automatic openers installed.

Two new "Gordon Ray" heating units were installed in the shop. After installation the contractor was asked to pressure test the service gas line and discovered a leak. The refuge crew excavated the gas pipe and discovered several nickle-sized holes in the steel pipeline. The holes may have been there for several years. A new plastic gas line was installed by the refuge crew.

Engineers made a field examination of the design problem on the Lake Creek diversion structures and discussed corrective measures with the refuge staff.

3. Major Maintenance

Facilities

Weeds and debris are cleaned annually along the thirteen mile Lake Creek canal prior to spring pumping. The Muddy Creek pumpsite is located 28 miles west of headquarters. Prior to pumping, the dam is set up and then taken down and cleaned after the pumping season. The pumps are checked and serviced three times weekly during the pumping season.

The D-6 Cat was used to level dirt mounds at the Muddy Creek pumpsite to prepare for silt removal. The silt removal job was contracted out to Falls Construction who finished the job in 4 days.

Electrical repairs were needed at the Muddy Creek pumpsite after a Montana Power Company transformer wire burned during pumping operations. Fuses inside the main control panel were damaged.

An excavator was hired to remove silt from the outlet canal in Unit II.

Roads and Dikes

Muskrat damage to the dikes was closely monitored and repaired when cave-ins were observed. Roads were graded when moisture conditions were right. Oversized rock were hand picked and removed from roadsides and parking areas prior to the annual mowing in preparation for the hunting season.

Equipment

Mack Truck Tractor - Marko constructed and painted ROPS and rear window/cab guard. A new "Jake brake" was installed and the power steering pump replaced by a commercial shop.

'79 Suburban - Marko rebuilt the carburetor, tuned, balanced tires and installed radio prior to putting vehicle on road,

GMC Dump Truck - Service including cleaning carburetor and fuel lines, brakes and seals replaced.

Combee Airboat - Trailer winch replaced and fender repairs. The propeller was reconditioned in a Florida shop.

Mita DC 142 RE Copier - Upon delivery this new copy machine had to have the main control board replaced before it would function. We hope the rest of bugs show up while it's still under warranty.

4. Equipment Utilization and Replacement

Malmstrom Air Force Base is located about 18 miles from the refuge and

is the primary source of surplus property. We screen only when convenient but try to maintain a regular liason with their local property office and with GSA Utilization Officer Jerry Musselman of Billings, Montana.

The following items were received and disposed of as indicated below:

Item Received	No.	Disposition	Received from
Trailer	1	Retained at refuge	Malmstrom AFB
Jeep	1	Medicine Lake NWR	" "
Jeep	1	Seedskaadee NWR	" "
Jeep	1	Valentine NWR	" "
Concrete stop blocks	120	Retained at refuge	" "
1970 Allis Chalmers road grader	1	" " "	" "
12 gauge shotgun	1	" " "	Bear River NWR
12 gauge shotgun	1	" " "	Quivira NWR
Tower steel - 82,150 lbs.		" " "	BPA - Helena, MT
Tower bolts - 1750 lbs.		" " "	" " "

New purchases included:

Honda 2 x 4 ATV
 Honda 4 x 4 ATV
 Mita 142RE copier
 Black & Decker 1 1/4" magnetic drill press
 Delco-Versa 100 pressure washer/steam cleaner
 Hitachi microwave oven

8. Other

Upon request, Region 6 Engineers made a site inspection and drew up proposals and cost estimates for two projects:

1. Office remodeling to accommodate handicap access
2. A smaller (one-half size) pumping unit for the Muddy Creek pumping station

J. OTHER ITEMS

4. Credits

Pearson wrote the Introduction, Sections A, F-2, 10 and 11, I-1 and 2, and K. Linehan wrote Sections C, D, E-6 and 7, F-5 and 9, H, I-3 and 4, and jointly with Dennis Orthmeyer wrote Section G. Benway wrote Sections B and E 1-5. Everyone compiled and edited. Benway typed and assembled the report.

K. FEEDBACK

86-14-4

07/28/86

RLP

Perspectives - - -

The "view" of "refuge management" is often seen differently from the field than is "seen" from the Regional Office.

Change is inevitable - - - with time - - - with organizational structure - - - with political leaderships - - - world populations and pollution - - - etc.

Good leadership, while negotiating the necessary changes, should be both willing and able to discuss the merits and background of decisions handed down to field stations. Without the candid exchange - enthusiasm, motivation and personal incentive to carry out programs are lost or greatly dampened. Communications have not been particularly well carried out.

An extensive Operation and Administrative Inspection was conducted and followed up by written reports with many decisions and changes in direction given with deadlines.

Part of my concern is that the ever enlarging regional staff not only places directly proportional increases in administrative work loads on field stations, but also in recent years is becoming too involved in making the day to day decisions at field stations,

REVIEW AND APPROVALS

BENTON LAKE
WETLAND MANAGEMENT DISTRICT

Great Falls, Montana

ANNUAL NARRATIVE REPORT

Calendar Year 1986

Robert L. Pearson 2/27/87
Refuge Manager Date

Refuge Supervisor Review Date

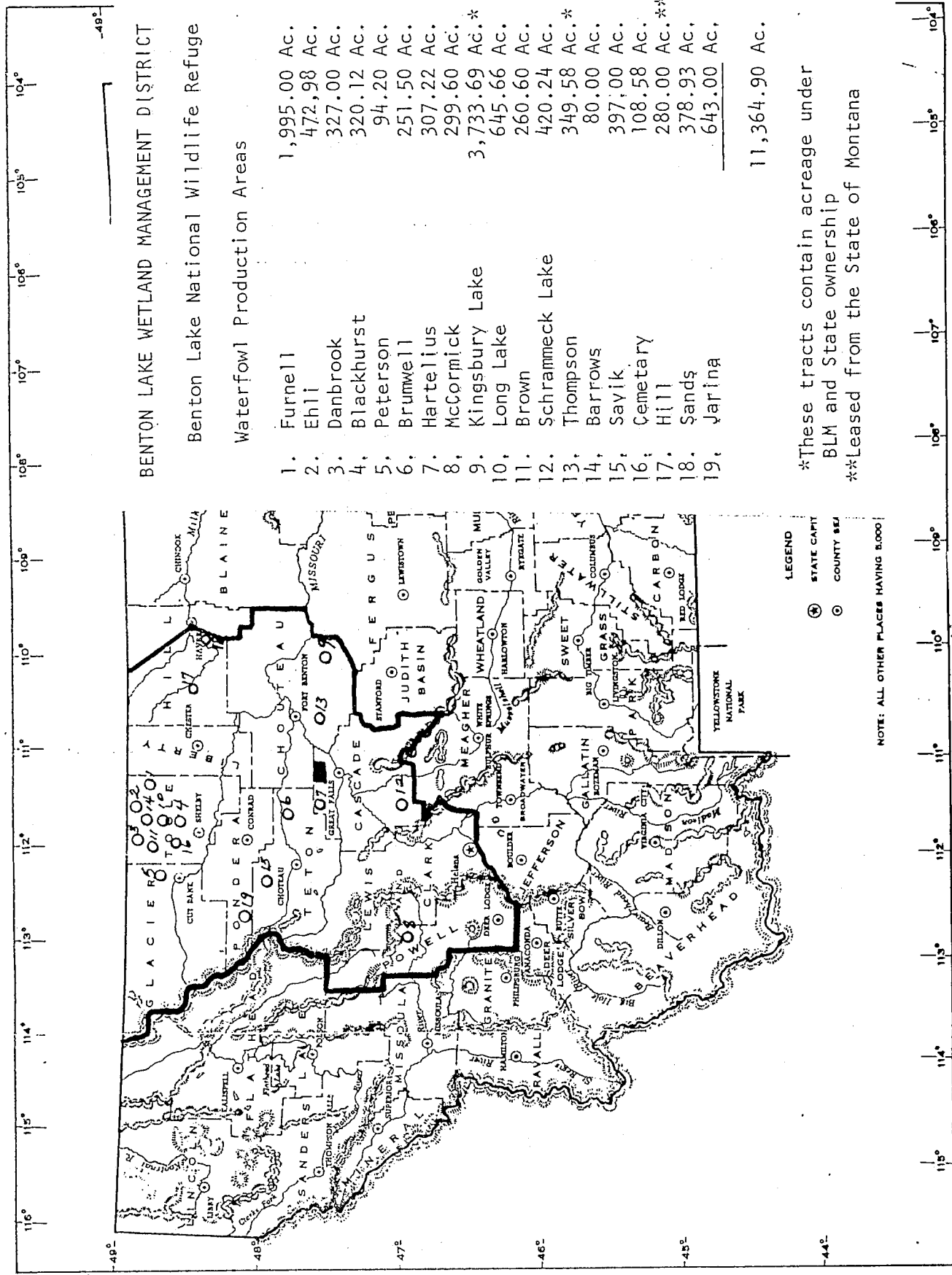
Regional Office Approval

Date

INTRODUCTION

The Benton Lake Wetland Management District was established in 1975. Initial delineation was conducted in 1966 and 1968 and in 1974 and 1975 by Marvin Plenert and Rod King. Acquisition began in 1974 by Realty Specialist Benjamin Lukes.

The district encompasses ten counties in north-central Montana from the Canadian border south to Deer Lodge, Montana. There are easements in all ten counties and waterfowl production areas in eight. The waterfowl production areas (WPA's) are widely scattered; the two farthest away are 120 miles from headquarters - each in opposite directions. The average distance to our WPA's from headquarters is 90 miles, which makes management difficult to say the least.



BENTON LAKE WETLAND MANAGEMENT DISTRICT

Benton Lake National Wildlife Refuge

Waterfowl Production Areas

1. Funnell	1,995.00 Ac.
2. Ehli	472.98 Ac.
3. Danbrook	327.00 Ac.
4. Blackhurst	320.12 Ac.
5. Peterson	94.20 Ac.
6. Brumwell	251.50 Ac.
7. Hartelius	307.22 Ac.
8. McCormick	299.60 Ac.
9. Kingsbury Lake	3,733.69 Ac.*
10. Long Lake	645.66 Ac.
11. Brown	260.60 Ac.
12. Schramneck Lake	420.24 Ac.
13. Thompson	349.58 Ac.*
14. Barrows	80.00 Ac.
15. Savik	397.00 Ac.
16. Cemetery	108.58 Ac.
17. Hill	280.00 Ac.**
18. Sands	378.93 Ac.
19. Jarina	643.00 Ac.
	<hr/>
	11,364.90 Ac.

*These tracts contain acreage under BLM and State ownership

**Leased from the State of Montana

MONTANA

INTRODUCTION

TABLE OF CONTENTS

Page

A. HIGHLIGHTS 1

B. CLIMATIC CONDITIONS 1

C. LAND ACQUISITION

1. Fee Title 1
2. Easements 2
3. Other Nothing to Report

D. PLANNING

1. Master Plan Nothing to Report
2. Management Plan 3
3. Public Participation Nothing to Report
4. Compliance with Environmental and Cultural Mandates. . . 3
5. Research and Investigations 4
6. Other Nothing to Report

E. ADMINISTRATION

1. Personnel 4
2. Youth Program Nothing to Report
3. Other Manpower Programs Nothing to Report
4. Volunteer Programs Nothing to Report
5. Funding Nothing to Report
6. Safety Nothing to Report
7. Technical Assistance 4
8. Other 5

F. HABITAT MANAGEMENT

1. General Nothing to Report
2. Wetlands 6
3. Forests Nothing to Report
4. Croplands 6
5. Grasslands 6
6. Other Habitats Nothing to Report
7. Grazing Nothing to Report
8. Haying Nothing to Report
9. Fire Management Nothing to Report
10. Pest Control 6
11. Water Rights 6
12. Wilderness and Special Areas Nothing to Report
13. WPA Easement Monitoring 7

G. WILDLIFE

Page

1. Wildlife Diversity	8
2. Endangered and Threatened Species	8
3. Waterfowl	8
4. Marsh and Water Birds	8
5. Shorebirds, Gulls, Terns and Allied Species	8
6. Raptors	8
7. Other Migratory Birds	Nothing to Report
8. Game Mammals	9
9. Marine Mammals	Nothing to Report
10. Other Resident Wildlife	9
11. Fisheries Resources	Nothing to Report
12. Wildlife Propagation and Stocking	Nothing to Report
13. Surplus Animal Disposal	Nothing to Report
14. Scientific Collections	Nothing to Report
15. Animal Control	Nothing to Report
16. Marking and Banding	Nothing to Report
17. Disease Prevention and Control	Nothing to Report

H. PUBLIC USE

1. General	9
2. Outdoor Classrooms - Students	Nothing to Report
3. Outdoor Classrooms - Teachers	Nothing to Report
4. Interpretive Foot Trails	Nothing to Report
5. Interpretive Tour Routes	Nothing to Report
6. Interpretive Exhibits/Demonstrations	Nothing to Report
7. Other Interpretive Programs	Nothing to Report
8. Hunting	9
9. Fishing	9
10. Trapping	9
11. Wildlife Observation	Nothing to Report
12. Other Wildlife Oriented Recreation	Nothing to Report
13. Camping	Nothing to Report
14. Picnicking	Nothing to Report
15. Off-Road Vehicling	Nothing to Report
16. Other Non-Wildlife Oriented Recreation	Nothing to Report
17. Law Enforcement	Nothing to Report
18. Cooperating Associations	Nothing to Report
19. Concessions	Nothing to Report

I. EQUIPMENT & FACILITIES

1. New Construction	Nothing to Report
2. Rehabilitation	Nothing to Report
3. Major Maintenance	Nothing to Report
4. Equipment Utilization and Replacement	Nothing to Report
5. Communications System	Nothing to Report
6. Computer Systems	Nothing to Report
7. Energy Conservation	Nothing to Report
8. Other	Nothing to Report

J. OTHER ITEMS

Page

1. Cooperative Programs	9
2. Other Economic Uses	Nothing to Report
3. Items of Interest	Nothing to Report
4. Credits	10

K. FEEDBACK . . Nothing to Report

A. HIGHLIGHTS

The 643 acre Jarina WPA was purchased in Pondera County and a 123 acre land exchange proposed (C.1).

Comments were provided on a draft EIS for the Conrad-Shelby 230 Kv transmission line (D.4).

The 1985 Farm Bill resulted in 47,758 acres of highly erodible land in the district being converted to vegetative cover (E.7).

A proposal to assign a 50 acre foot water contract to the district for use on the Sands WPA was submitted by Mr. Gordon Sands (E.11).

B. CLIMATIC CONDITIONS

Climate is discussed in detail in the refuge narrative report. Spring precipitation coupled with good 1985 fall rains was enough to break the 4 year drought and put water into wetlands throughout most of the district.

C. LAND ACQUISITION

1. Fee Title

The wetland district currently has 19 WPA units totalling 11,364.9 acres including 9,139.11 under fee title. Two WPA's include acreage under BLM and State ownership and the Hill County WPA (280 acres) is leased from the State of Montana.

The Jarina WPA (643 acres) in Pondera County was purchased in 1986. This tract is near the east slope of the Rocky Mountains, contains a beautiful wetland complex and is the first WPA in Pondera County.

A land exchange at the Jarina WPA was part of the original purchase plan and negotiations with the adjacent landowner began this year. Realty Specialist Rich Johnson, USFS Archaeologist Gary McOwen and Manager Pearson inspected the 123 acre land exchange tract. Discussions with landowner Bill Jones included site clean-up plans, grazing rights termination and vehicle access problems. We recommended against obtaining an easement on the small shoreline portion of Cody Lake in conjunction with the land exchange because of water rights problems on the lake.

An ascertainment report and biological assessment (in EA form) were prepared and submitted in support of the 123 acre land exchange. The assessment accompanied the realty package to the Washington Office for future Congressional approval.

During the initial inspection an additional land exchange proposal was made by a neighbor. This second exchange would solve fencing and site clean-up problems in addition to giving the government added quality wetlands and will likely be purchased next year.



Jarina WPA - Field inspection of Jarina WPA was undertaken by the whole staff to scope out the extent of future work projects. Vince Marko thought this new vehicle would require a little touch up work before he could put it on line.
86-16-32 09/12/86 RLP

Manager Pearson conducted field inspections of several possible fee acquisitions in Teton and Chouteau Counties during the year. One area, Harwood Lake, will be recommended for future purchase if monies become available.

2. Easements

No new easements were acquired this year. The district contains wetland easements in each of the ten counties. A total of 7,088 wetland acres are protected in 133 tracts.



Beautiful Harwood Lake south of Fort Benton, MT, supports an excellent population of waterfowl, contains a few natural islands and has several prime peninsula areas that could be converted into nesting islands. This unit should be given high priority for wetland acquisition - - either as a WPA or small refuge unit.
 86-12-24 07/24/86 RLP

D. PLANNING

2. Management Plan

Objectives for the wetland management district have not been specifically documented, but correspond to the objectives of other wetland management districts under the small wetlands program. Short range development plans are made for each WPA unit upon being acquired. Manpower and funds generally limit our activities to posting, fencing and conversion of cropland to dense nesting cover.

ARRM's and Resource Problems funding projects were submitted for the wetland management district.

4. Compliance with Environmental and Cultural Resource Mandates

Manager Pearson assisted Tom Ring (MT DNRC) and Gary Olsen (MT FWP) in monitoring waterfowl use in the proposed locations of a Conrad--Shelby 230 Kv transmission line. The Western Administration Power Authority (WAPA) project would result in the line crossing the Marias River and wetlands in the Shelby area. Several wetland basins including Service wetland easements will be impacted by the project. Although the draft EIS document mentions the potential for bird strikes,

no assessment of the amount of loss or mitigation for bird losses is provided. Our comments on the EIS were sent to Ecological Services, Billings, for inclusion in their official comments. We recommended that mitigation be included for waterfowl losses due to collisions with the line.

An archaeological survey was conducted by USFS Archaeologist Gary McOwen on the 123 acre land exchange parcel on the Jarina WPA. No cultural resources were discovered.

5. Research and Investigations

Saline seeps are becoming a primary problem due to past and current farming practices. The contamination of water within the district is primarily due to the fallow cropping system. In 1981, by cooperating with the Triangle Conservation District, a series of shallow cased wells were drilled on two WPA's for the purpose of monitoring subsurface water tables. Data collected from these test wells will provide information on changes in ground water levels in response to our grass-legume planting and adjacent farming activity on recharge areas.

Assistant Manager Linehan attended a Salinity Control Forum in Conrad, Montana, sponsored by the Montana Salinity Control Association. The good news is the general policy of the MSCA to address the cause of saline seeps by re-establishing permanent vegetative cover on recharge areas. The bad news is the Canadian (Alberta Agriculture) government offers financial assistance in designing subsurface drainage systems and still advocates the use of tile drainage to drain seep areas (see Appendix I).

E. ADMINISTRATION

1. Personnel

The ten county district is administered by personnel at Benton Lake Refuge and does not receive separate staffing or funding. For further information on youth programs, funding and safety, see the Benton Lake Refuge narrative.

7. Technical Assistance

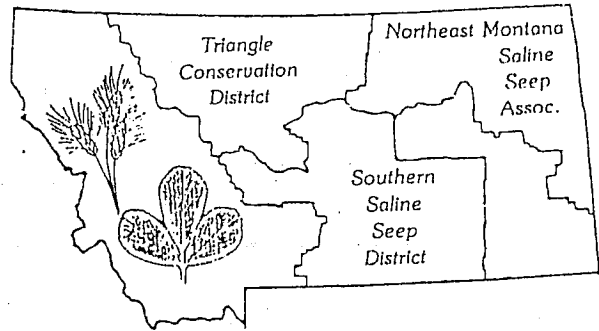
After several years of work, the Kleinschmidt Lake proposal was completed. Assistant Manager Tornow and representatives from the Montana Department of Fish, Wildlife and Parks, Montana Department of Natural Resources and Conservation, Bureau of Land Management and the Bonneville Power Administration formed the Kleinschmidt Lake mitigation committee in 1984. Developments were proposed on Kleinschmidt Lake and adjacent FWS easements as a mitigation project for losses of waterfowl from power lines crossing the Missouri River in the Helena Valley. Upon completion of a hydrological study, water rights search, land and water elevation survey,

Montana Salinity Control Association

P. O. Box 1411
Conrad, Montana 59425
Phone (406)278-3071

December, 1986

FACT SHEET



PROBLEM: Saline seeps are recently developed low-volume springs caused by change in land-use, predominantly from native perennial vegetation to the alternate crop-fallow dryland cropping system. The saline seep or discharge area, is actually the symptom of inefficient use of annual precipitation in the up-slope or recharge area. Saline seeps, water quality degradation, erosion and soil organic matter decline, are only symptoms of the problem.

NEED AND URGENCY: Saline seep is among the top 4 resource problems in MT. with over 280,000 acres of cropland estimated out of production, and the rate grows at 10% per year. Using an average of \$40/acre net return in a crop-fallow system, \$5,600,000.00 is lost in annual production. The taxes on the salinized land can be reassessed at a lower value (from a \$2.30/ac avg. for cropland to \$0.34/ac avg.) for a potential yearly loss in tax revenue of \$548,000.00. The degradation to surface and groundwater is not easily quantified but is perhaps the most severe consequence. Degraded water quality goes beyond the individual landowner to affect both the rural and urban population. Wells and reservoirs are abandoned and irrigation is reduced or eliminated. Numerous rural water lines have been needed because of poor water quality. It has cost the state over \$2.5 million in grants and loans to help finance these, not to mention the increased maintenance costs to the users. The water quality in most seeps exceeds the recommended limits for any domestic use and has been documented as high as 78,000 mg/l TDS or twice that of sea water. At present levels, saline seep is costing MT in excess of \$11,352,000.00 per year. If allowed to go unchecked, this figure could grow in the next 20 yrs. to \$76,370,000.00 for 1.8 million acres (assuming 10% growth rate). Therefore, the prevention of saline seeps is just as important as reclamation of existing ones.

TECHNIQUE: The MT. Salinity Control Association technical field team has developed a proven technique to work on a farm-by-farm basis to achieve saline seep prevention and reclamation using state-of-the-art recharge area identification, intensive cropping, and reclamation techniques. In the 7 years the MSCA has been working on the problem, 266 individual reclamation plans have been developed. The implementation rate has been 84%, a very impressive rate considering the increased costs and management necessary for the cooperators.

NEW STATE GROUP: The MT. Salinity Control Association (MSCA) was formed in June, 1985, to encompass the three organizations involved in salinity reclamation and prevention, which include the Triangle Conservation District (TCD), Northeast MT. Saline Seep Association (NMSSA) and the Southern Saline Seep District (SSSD). The 1985 Legislature provided funding for the 33-county area with grants from the coal and mineral tax interest funds. In addition, for the first time a portion of the project budget is being provided through the State's General Fund, which is a major step towards a stable, long term program. The project funding is administered through the Dept. of Natural Resources and Conservation (DNRC).

MSCA continues to generate one third of the total budget through charges to the landowners and for special projects related to water quality. In order to cut administrative expenses, a six-member executive board was elected to provide policy and guidance to the staff.

Chairman:	Pete Purvis	- Box 126, Froid, MT. 59226	963-2283	NE MT. Saline Seep Assoc.
Vice-Chairman:	Alvin Boxwell	- Box 235, Cut Bank, MT. 59427	336-2321	Triangle Con. District
	John Zinne	- Rapelje, MT. 59067	663-2203	Southern Saline Seep Dist.
	Ellis Hagen	- Westby, MT. 59275	385-2508	NE MT. Saline Seep Assoc.
	Keith Lockie	- Angela, MT. 59312	354-7391	Southern Saline Seep Dist.
	Tom Burns	- Box 595, Chinook, MT. 59523	357-4207	Triangle Con. District

two public hearings, and additional funding and assistance from Ducks Unlimited, the project was submitted to the Montana Board of Natural Resources and Conservation for their approval. The mitigation committee met with the Board of Natural Resources and Conservation and explained the project proposal, development of islands, cut-off peninsulas and filling in of an old drain to mitigate for waterfowl losses. The Board approved the project and gave permission to proceed with necessary permit clearance, landowner agreements and development in 1986. Dirt work on the project was completed in November, 1986.

The District actively participated in the 1985 Farm Bill by providing information and assistance to landowners and SCS personnel. The Conservation Reserve Program (CRP) offered farmers start up costs to aid in establishing cover plantings in highly erodible lands and annual rental payments for leaving this established cover for a ten year period. Over 48,458 acres were signed up for CRP cover establishment in the District which will be a boost for wildlife. Assistant Manager Tornow sent maps of WPA's and records of grass plantings to SCS District Conservationists in Cascade, Chouteau, Teton, Glacier and Toole Counties. This provided an opportunity for landowners to view 3 to 6 year old grass plantings and also plantings over 10 years old on Benton Lake NWR. Assistance was offered for the CRP sign-up period and also during the development of the conservation plans. The opportunity to harvest grass seed from WPA and refuge grass plantings was also discussed. Future swampbuster violations will be reported to the FWS State Farm Bill Coordinator.

TABLE 1

1986 CRP ACREAGE IN BENTON LAKE WMD

<u>County</u>	<u>Farms</u>	<u>Acreage</u>
Cascade	20	6,333
Chouteau	31	9,497
Glacier	20	7,354
Hill	1	29
Powell	0	0
Teton	40	16,835
Toole	21	5,642
Pondera	7	736
Liberty	9	1,241
Lewis & Clark	2	91
TOTALS	151	47,758

8. Other Items

Revenue sharing checks for Fiscal Year 1985 were received late (June) and were only 64.4% of entitlement. Revenue sharing checks were delivered to the Cascade, Chouteau, Hill, Teton, Glacier and Toole County Commissioners. The revenue check was mailed to the Powell County Commissioners.

F. HABITAT MANAGEMENT

2. Wetlands

Two of our WPA's have water control structures. One at the Ehli WPA cannot be used until the necessary private inholding is acquired. The other structure is at the Furnell WPA and is dependent on adjacent landowners' willingness to divert water toward the WPA.

Most wetlands on the district received runoff this year for the first time in four years. By summer's end, most WPA's were dry. Only five held sufficient water this year for assured brood production.

4. Croplands

Since 1978 we have converted 1958 acres of cropland in the wetland management district to DNC.

This year we administered two cooperative farming permits for 99 acres. The cropland is used to alleviate crop depredations in Toole County as part of a public relations agreement. Barley was planted on 46 acres and the remaining 53 acres were summer fallowed. Cooperator Mike Lerum delivered the refuge's one-third share of 200 bushels of barley for duck banding operations. The refuge trucked in an equal amount from the other cooperator.

5. Grasslands

The 19 WPA's currently contain 4366 acres of native short-grass prairie. Initial management is to rest these areas from grazing and to fence the boundaries to prevent trespass grazing. Grasslands will be monitored and treatments prescribed when grassland vigor begins to decline. No grazing, haying or prescribed fire was done in the district in 1986.

10. Pest Control

Musk thistle was sprayed with a Banvel and 2,4-D tank mix on the Savik WPA. No other specific complaints were received from county commissioners. A joint inspection of the Hill County WPA in an adjoining neighbor found only a very minor noxious weed problem - insufficient to justify sending a spray rig in.

11. Water Rights

Mr. Gordon Sands offered to transfer to the Service his 50 acre feet annual water use contract on the Lower Beaver Creek Reservoir for diversion into the Sands WPA.

Diversion locations from the Beaver Creek Canal was inspected with landowner Doug Arhard and with Don Anderson, Foreman of the Ag Experiment Station at the old Fort Assineboine. Gordon also volunteered to purchase the remaining portion of the WPA lake basin from the Havre Airport if our realtor could negotiate a price with the airport board. The

remaining portion of the lake basin would need to be purchased in order to exercise the use of the 50 acre feet of water. Later negotiations with the airport resulted in a decision to request a flowage easement instead. After the FAA okayed our plans for the water right transfer Realty Specialist Rich Johnson and Assistant Manager Linehan met with the Havre City-County Airport Board in December to request the flowage easement. The board okayed the flowage easement with one board member dissenting, noting he disapproved of any management action likely to increase bird numbers and potential bird/aircraft collisions.

13. WPA Easement Monitoring

The wetland easement surveillance flight was postponed until November because of the warm open October weather. The flight was cancelled when the snow and cold blew in November 1. The annual flight will be rescheduled for spring, 1987.

Depth measurements were made on four pre-existing ditches in Toole County 38X and 38X-1 easements (Sollid). A dozer and scraper were parked in the tenant's yard, but no activity was noted on surrounding easements.



Toole County easement 38X-1. Both photographic and surveying data were collected on four partially drained basins to provide a basis for protecting the remaining wetland values.

86-10-31

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RLP

Aerial photos were ordered from the Department of Agriculture (ASCS) to complete our coverage of Toole and Glacier County easements. All easements were mapped and townships, ranges and sections marked.

G. WILDLIFE

1. Wildlife Diversity

The district contains at least three distinct habitat types. Most of the WPA's are located in the short grasslands of the high rolling plains. The Sweetgrass Hills along the Canadian border are high elevation glaciated prairie (Furnell WPA). The high mountain valley riverside habitat is represented by the McCormick WPA near Ovando.

2. Endangered Species

Sightings of bald eagles, American peregrine falcons, prairie falcons, Richardson's merlins, and ferruginous hawks have been made in the district. Only the ferruginous hawk has been documented as nesting on our WPA's (Kingsbury Lake). The bald eagle nests near the McCormick WPA.

A possible sighting of a trumpeter swan family occurred on the Jarina WPA in the fall. Trumpeter swans have nested along the Rocky Mountain front in the general vicinity in Pondera County.

3. Waterfowl

A partial breeding pair count along with general observations formed the basis of roughly estimating waterfowl production on our WPA's at 5,465 ducks and 130 Canada geese.

4. Marsh and Water Birds

Sandhill cranes have nested on the Savik and McCormick WPA's. Five species of grebe; pied-billed, horned, eared, western and red-necked. have been known to nest in the district.

5. Shorebirds, Gulls, Terns and Allied Species

Population estimates and use are unknown for 1986. Small colonies of Franklin's gulls and black terns have been known to nest on Schrammeck Lake and McCormick WPA's in past years. Long-billed curlews were present on several WPA's.

6. Raptors

Raptors that are known to nest on several of the WPA's are the red-tailed hawk, short-eared owl, marsh hawk and great horned owl. Other raptors seen regularly are the golden eagle, Swainson's hawk, Cooper's hawk, and the American kestrel. Additional raptors are mentioned in the Endangered and Threatened Species section.

8. Game Mammals

Deer numbers appear to have generally peaked in the district in 1984. Mule and white-tailed deer use continues at high levels in response to our DNC plantings and are present on most WPA's. Hunting is allowed in accordance with state regulations on all of our WPA's except the Sands WPA, where hunting and trapping are not allowed as part of the deed stipulations. A cow elk was observed on the McCormick WPA on August 26.

10. Other Resident Wildlife

Huntatable populations of Hungarian (gray) partridge, sharp-tailed grouse and ring-necked pheasant are present on several of the WPA's. Pheasants have become established on the Danbrook WPA from bird releases in nearby Canada. Coyote, red fox, raccoon, badger, striped skunk, mink, weasel and rattlesnakes are also present. Two covies of partridge and one pheasant brood were observed on the Hartelius WPA this year,

H. PUBLIC USE

1. General

Monitoring public use on the district is very difficult. Most of the information we receive is reported directly to our office or is obtained by talking to adjacent landowners if we get the opportunity.

8. Hunting

Upland game, waterfowl and big game hunting is allowed on all the WPA's except the Sands WPA. The degree of hunting pressure and success is unknown.

9. Fishing

Fishing by floating the Blackfoot River is locally popular in the Ovando Valley. The amount of public use on the Blackfoot River as it passes through the McCormick WPA is unknown.

10. Trapping

Trapping information is minimal. Trapping of muskrats, raccoon and coyote occurs on several WPA's.

J. OTHER ITEMS

1. Cooperative Programs

Assistance was provided to the Montana Department of Natural Resources and Conservation and the Department of Fish, Wildlife and Parks in monitoring and evaluating waterfowl use along the proposed locations of the WAPA power line crossing of the Marias River. At the same time waterfowl use of the FWS easements was also monitored south of Shelby.

4. Credits

This report was written by Linehan, edited by Pearson and typed by Benway.

THE WESTERN CANADIAN PERSPECTIVE ON
DRAINAGE OF SALINE LANDS

by

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Alberta Agriculture
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December, 1986

THE CANADIAN PERSPECTIVE ON DRAINAGE OF SALINE LANDS

BACKGROUND

Although Canada has a land mass that ranks third in terms of area, the land available for agricultural use is limited. The total land area of Canada is 2,278 million acres, of which only 7.3% (166 million acres) is farmland. Only 4.3% (108 million acres) of the total area is cultivated. The Canada Land Inventory categorized 0.5% (10 million acres) of soils as class one, and 5% (111 million acres) as class one, two and three.

To put this into perspective, prime agricultural cropland in Canada is equivalent to the cropped area of Ohio. Canada's total dependable cropland area is about the size of California. As well 85% of Canada's class one soil is located in areas of climatic restriction - mainly a short growing season. (SSSA, 1984)

These agricultural areas are subjected to reduced productivity by a variety of factors. Organic matter levels have declined by 40-60% across the prairies. Soil erosion by both wind and water have become a major concern in the 1980's - the result of monoculture and larger farm equipment. Salinization of Alberta soils accounts for a loss of 1.75 million acres according to a recent salinity survey. Acidification of soils, a more subtle problem, is difficult to measure in terms of productivity loss. Urbanization accounts for a 43,000 acre loss per year with another three to ten times that for related additions such as power lines, highways, etc. (SSSA, 1984)

LEGISLATION

The legislated authority in Canada is divided between the federal and provincial governments. The British North America Act, written in 1867 when Canada became a country, specified those responsibilities. The British North America Act was rescinded in 1982 when Prime Minister Pierre Trudeau and Queen Elizabeth II of England signed the Canada Constitution. The B.N.A. Act and Constitution are generally similar regarding the division of authority. Under Article VI, Section 92, 'Exclusive Powers of Provincial Legislature', line 5; 'The Management and Sale of Public Lands...'; and Section 10 'Local Works etc. (a) canals, etc.', the authority for lands and waters are given to the provinces. (Oliver, 1982)

Within Alberta, under the Water Resource Act, Alberta Environment is given responsibility for management of water resources. This authority includes diversion, use, or impoundment of water; including storage for irrigation or for erosion control, and drainage to reduce spring flooding, ponding or for salinity control. The Minister of Environment may issue a licence for these purposes. The licence is a form of property rights and is granted to the landowner for the protection of his use. Domestic agriculture water use (ie. wells, dugouts, troughs and cisterns) need not be licensed.

GOVERNMENT RESOURCES

Alberta Environment is responsible for the planning and management of general water supply and control and provides an engineering support service for construction management and supervisory services. This includes river basin planning, hydraulic and structural design for surface drainage, flood control, erosion control, and irrigation water supply and lake stabilization.

Alberta Environment has developed Position Paper No. 5 which outlines the province's policy for cost-sharing of water management projects. For a particular project a feasibility study, including an investigation into alternative solutions and cost estimates, must be submitted to Alberta Environment for review and approval. Alberta Agriculture often works with Alberta Environment in financial and technical support for mutually beneficial projects.

Alberta Agriculture's area of responsibility is directed mainly to on-farm resource management with some overlapping of programs with Environment in salinity control, irrigation reclamation, soil conservation, etc. Under the salinity program, Alberta Agriculture offers assistance in designing subsurface drainage systems to reduce soil salinity in seepage areas. Alberta Agriculture, in cooperation with Agriculture Canada, is researching various techniques for the control and reclamation of saline seeps. Alberta Agriculture also provides assistance for irrigation farm development, soil surveys, systems design, and plan and cost estimates.

Alberta Agriculture offers financial support through local authorities like Irrigation Districts and Counties (Ag. Service Boards) to cost-share in programs related to conservation. This includes erosion, salinity and sodic soil problems. Individual farmers can receive financial support for liming of acid soils and other conservation practices. (Lilley, 1982)

PROVINCIAL AGREEMENTS

The original Prairie Provinces Water Board was formed in 1948 to administer interprovincial streams and rivers. Related staff functions were carried out by staff of the Prairie Farm Rehabilitation Association (PFRA).

In 1969, Canada and the provinces of Manitoba, Saskatchewan and Alberta entered into an agreement to share the flow of mutual streams and to consider the quality of eastward flowing interprovincial waters. This includes all eastward flowing streams from the prairies, which except for the Milk River, end up in Hudson's Bay. The Prairie Provinces Water Board was given the responsibility to administer the agreement, and several committees were formed under the board. Hydrology, Water Quality, Groundwater and Interjurisdictional Agreements Committees meet and discuss findings and issues. (PPWB, 1986)

The impact of drainage on downstream water quality was mentioned as a concern in 1984. Since then it has been agreed that committee members will supply listings of new projects on interprovincial streams. Information on projects constructed prior to this time will be reported on an ad hoc basis. (PPWB, 1986)

The Board has also requested that a water demand study report be updated to look at recent trends. The Committee on Water Quality was directed by the Board to establish a task force to develop a monitoring strategy that will consider quality parameters on the 11 monitoring stations established on interprovincial streams. The Committee on Water Quality has been collecting information on water quality at these stations. The report on this data will be presented in November 1986 to the Board.

A preview of this report on water quality indicates that committees have been formed, guidelines have been established, data has been collected, and reports prepared. This information is to be assessed in the winter of 1986-87 and a decision made as to how to proceed. (PPWB, 1986).

The agreement on interprovincial streams basically states that Alberta will allow a flow of one-half of the natural flow of each water course passing through Alberta to flow into Saskatchewan. This does not prohibit Alberta from consuming any quantity of water from any water course as long as flow is compensated from other streams. This agreement allows Alberta to intensify management of the South Saskatchewan River Basin.

TILE DRAINAGE

Most of Alberta's tile drainage is located in the South Saskatchewan River Basin as is virtually all of the 1.2 million acres of irrigation. The Irrigation Division of Alberta Agriculture has been monitoring specific drainage sites since 1977. Researchers have been projecting effects on water quality based on flow of rivers and the amount of drainage being done. In 1981, about 760,000 meters of tile was installed - half of this on irrigated land and half on dryland.

Samples taken from 20 tile sites show half have a similar chemical composition to those reported by Bower. The effect of different chemical constituents has yet to be determined. Alberta effluent chemistries are lower in sodium and chlorides and higher in magnesium and sulphate than reported U.S. flows. Toxins like cadmium, selenium and boron are low to nil.

A limiting factor in drainage impact is low river flows. Though water quality from tile is poorest in late winter when river flows are lowest, tile volume is also very low at that time of year. Drainage flows are of highest quality in summer and fall but are also discharging greater amounts. Monitoring over a period of years shows no marked change in the quality of water discharging from tiles increase in discharge quality.

The problem is, how much land can be realistically drained and still meet water quality standards. (Harker, 1982)

Calculation indicates drainage of 500,000 acres (Alberta's maximum likely dryland and irrigated drainage requirements) would require about 72 million meters of tile. Over a five year period (1977-1981) less than 2.5 million meters of drain tile was installed in Alberta. At this rate, it will take over 100 years before the projected level of maximum drainage is reached. Assuming a maximum realistic projection of 20% of irrigated lands and 30% of dryland saline seeps being drained, under

average flows river EC would increase from 360 mg/l to 470 mg/l or about 33%. Consequently, the only real water quality problems anticipated will occur after extensive drainage installation and during brief periods of low river flow. (Harker, 1982).

CONCLUSIONS

Alberta Agriculture has been monitoring the effects of drainage effluent on the water quality of interprovincial rivers for about 10 years. Findings indicate that normal river flows will result in minimal changes in quality with todays drainage. During periods of very low river flow, extensive futuristic drainage discharge could greatly increase river salt loadings. This may be of concern, but not within the foreseeable future. Research shows that during summer when river flows are high, the drainage discharge quality is good. During late winter-early spring when river flows are low, drain discharge quality is low, but flows are minimal.

The Prairie Provinces Water Board will meet this winter to determine from their data what levels of contamination are now being discharged into the river systems. The Board will also determine what levels of contamination are acceptable. Once these decisions are made we will be able to determine how to achieve them. These decisions will affect installation of any future projects.

Currently, a limiting factor to drainage installation is the average \$600-\$800 per acre installation cost. On irrigated land where productivity is higher, leaching volumes are greater and a better drainage program exists, subsurface drainage may expand. On dryland however, where cost effective methods of reclamation are key to economic survival, subsurface drainage is expensive. On dryland, subsurface drainage has not always been as effective as irrigation when dependant on natural precipitation for leaching. As well, many saline areas that have been non-productive for several decades have lost their soil horizons and therefore would have limited agricultural return. Still, throughout Alberta some 700 on-farm drainage sites exist. About 60% of these are on dryland. (Harker & Mikalson, 1986).

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